THE ENGINEERING AND MINING JOURNAL.

RICHARD P. ROTHWELL, C. E., M. E.
ROSSITER W. RAYMOND, Ph. D. } Editors.

NOTE.—Communications relative to the editorial management should be addressed to Mr. ROTHWELL. The articles written by Mr. Raymond will be signed with a star.

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AMERICAN INSTITUTE OF MINING ENGINEERS.

OFFICIAL BULLETIN.

THE following excursions will form interesting features of the meeting of the American Institute of Mining Engineers, which will be held in Philadelphia, commencing June 20th:

First excursion, June 22d. A trip by steamboat on the Delaware River for social intercourse and inspection of shipping facilities. The Navy Yard and prominent iron works between Richmond and Chester will be visited.

Second excursion, June 24th. By rail to Phœnixville and Bethlehem, Pa., visiting the copper works, the bridge works, and the mills of the Phœnix Iron Company, and the plants of the Bethlehem Steel Works and Bethlehem Zinc Works.

Third excursion in the early part of the following week. By rail to Reading, Lebanon, and the anthracite coal fields, covering two days. The shops and mills of the Philadelphia and Reading Railroad Company at Reading, the Cornwall ore hills, blast furnaces, and the prominent features of the southern and middle coal basins will be visited.

Other excursions may be announced at the meeting of the Institute.

The local Committee of Arrangements is composed of the following gentlemen, who will be pleased to offer members any courtesies at their command:

JOHN B. PEARSE (Chairman), 1,601 Walnut Street.
I. W. MORRIS, 238 South Third Street.
WM. LORENZ, 226 South Fourth Street.
THEO. D. RAND, 27 South Third Street.
PERSIFOR FRAZER, Jr., 225 South Sixth St.
H. S. DRINKER, 1,906 Pine Street.
JOHN BIRKENBINE (Secretary), 152 South Fourth Street.

THE EMMA MINE IN CONGRESS.

THE report of the Committee on Foreign Relations of the House of Representatives, concerning the connection of General SCHENCK with the Emma Mining Company, is dignified, forcible, and temperate. The whole subject of the actual value of the Emma Mine, concerning which so much relevant and irrelevant testimony was taken by the Committee, is very properly passed by. The attitude and course of General SCHENCK are condemned, as they should be, on grounds independent of that question altogether, as "ill-advised, unfortunate, and incompatible with the duties of his official position." The unanimity of the Committee, Democrats and Republicans, in this verdict, will, we trust, be reflected in the debates and final action of the House, so that the declaration of principle involved may be lifted above the level of partisan politics, to the importance of a national decree.

Mr. HEWITT, the author of the report, accompanied it with a characteristically terse and caustic speech, in which several of the parties to the Emma negotiation were severely handled, and the Administration, as well as its Minister, received a share of the blame. But the question of the value of the mine was ignored in the speech, as in the report. The operations incident to "floating" a mining enterprise, particularly in the London market, are worthy of all the scathing denunciation that can be heaped upon them. The Emma case seems to have been bad enough; but we have known cases worse than the Emma, in every respect except the amount of money involved and the participation of a diplomatic representative. We fancy that a good many American and English operators have reason to rejoice that it has not been their fate to fall into the hands of Mr. HEWITT. *

THE BLACK HILLS.

A PAMPHLET of 71 pages, now lying before us, contains Chapters V., VI., and VII. of the forthcoming Report of the exploration of the Black Hills of Dakota, made last year, under the direction of the Commissioners of Indian Affairs, by WALTER P. JENNEY, E. M. These chapters give an account of the general geology, mineral wealth, climate, and rainfall, and natural resources of the region. We have read them with much satisfaction; and we think they reflect great credit upon their author. It is not often that the "preliminary reports" of ambitious young explorers are so compact, clear, and free from useless cumbering matter. Mr. JENNEY appears to have executed his field-work conscientiously, and with so much quick intelligence as to have gained a very distinct conception of the structural plan of the district, which he has been remarkably successful in expressing in words. A gift so fortunate and useful sometimes misleads its possessor into rash generalizations, tempting him to substitute the symmetrical creations of his own genius for those patient inductions which bring results less pretty, though more true; and we are now and then annoyed, as we read Mr. JENNEY's flowing and positive descriptions, with the suspicion that he has come to his conclusions a little too rapidly to be safe in such certainty as he evinces. Yet we would not have him adopt instead the method of those geologists who, fearing lest their reputation may suffer from too definite an expression of their first impressions, take refuge in tedious itineraries or confused, incoherent reports of observations, muddying the channel of their story, lest its shallowness should be suspected. It is true, one sometimes underrates the depth of clear water; but one has still less respect for a puddle. We thank Mr. JENNEY for a notably complete and consistent picture of the geology of the Black Hills. Whether it is in all respects correct or not, will doubtless be shown by experience hereafter; meanwhile, we can comprehend and enjoy it—which is a great boon. These remarks apply particularly to the outline of the geological structure which he has given, and to his determinations of the nature, age, and relations of the different formations. With reference to the extent and value of the gold-bearing deposits, there is no doubt of the trustworthy nature of his conclusions. So far as the conditions of the case permitted, he has made an admirable *reconnaissance* in this respect.

The Black Hills offer an excellent opportunity for a geological study. "Surrounded on every side," as Mr. JENNEY says, "by level or rolling plains, and separated from the main chain of the Rocky Mountains, they have a geological system perfect and complete in itself, with the records beautifully preserved in the rocks, and each successive formation fully exposed by uplift and erosion to scientific investigation." This geological system he finds to consist of a nucleus of upturned Archæan mica-schists, slates, and quartzites, surrounded by belts of subsequent formations, in the order of their deposition, dipping from the center toward the level plains, the whole having been a flat dome or arch, the top of which has been planed off by erosion, leaving the edges of the later strata as annular concentric borders around the central nucleus. These strata, as he has determined them, are—the Potsdam sandstone; a dark-brown carboniferous sandstone and, upon this, massive deep-water carboniferous limestone, both resting immediately and conformably upon the Potsdam; then the "red beds," supposed to be Friessic, because they are "included between well-marked carboniferous and Jurassic;" then the latter, surmounted by the Cretaceous, which "closes the geological formation represented in the Black Hills by sedimentary strata of marine origin." From the Potsdam to the top of the Cretaceous the formations are perfectly conformable, "showing that no disturbance of the strata occurred during that time, and that the rocks of the different ages were nearly horizontal until the elevation of the Black Hills took place, and the trachyte forming the peaks in the upper part of the range was ejected through the slates and overlying strata." This diagnosis is reasonable in itself; and we are only surprised at the entire absence of the Devonian and the greater part of the Silurian rocks. If Mr. JENNEY's brown sandstone and massive limestone are certainly Carboniferous, we shall be inclined to expect the discovery, at some points, perhaps, not examined by him, of traces of the two great missing ages, which are, we believe, not without representation in the main range of the Rocky Mountains.

Mr. JENNEY says the Archæan rocks cover about 900 square miles, the total area of the Black Hills being about 6,000. He divides them into schists and slates, the former usually micaceous, occupying the southeastern part, and the latter (clay-slates and quartzites, supposed to be more recent than the schists) extending in a parallel belt southeast from the extreme north to a point nearly east of Harney's Peak. A notable feature of the schists is the intrusion between the strata of immense masses of white felspar-granite, of which, for instance, the Harney's Peak range, eight miles long by two to four miles wide, is wholly made up. "Narrow dykes of granite traverse the schists conformably to the stratification." In the northern part of the Black Hills are numerous domes and peaks of trachyte, which has been ejected through the slates and other strata, including the carboniferous formations. These trachytes, Mr. JENNEY says, contain gold disseminated through the mass of the rock, and by decomposition and erosion have furnished a large portion of the gold contained in the gravel deposits of that area. We will accept meekly the statement as to the trachytes; but we must take leave to doubt what Mr. JENNEY seems to consider beyond a question, the plutonic nature and the intrusion, parallel with the schistose strata, of his granite dykes. Not that such a statement is obviously incorrect: but it is one of those points on which a slight preconception may easily mislead a very intelligent observer. Mr. JENNEY, in a subsequent portion of his Report, acutely and conclusively disproves the fissure theory as applied to certain intercalated masses of quartz and quartzite. Is it not possible that a general impression of the plutonic character of granite as such has led him to mistake intercalated granites for intruded masses? The evidence for his view appears to consist in slickensides on the sides of the dykes, and fragments of the country rock inclosed in them. The former is not conclusive proof; and the latter should be taken with great caution, where the country rock is micaceous schist. Both these evidences might be adduced to demonstrate the "intrusive" character of the magnetic ore-beds of the Highlands, or many of the layers of the gneissic rocks of the same region; yet the conclusion would undoubtedly be false.

We cannot follow further the geological description of Mr. JENNEY. It is

always interesting and intelligent, positive and plausible. We must give a brief notice to his account of the gold deposits.

With the exception of the singular auriferous trachytes above referred to (which, by the way, are too poor to pay for working as ores), the source of the mineral wealth of the Black Hills is the Archæan nucleus of upturned schists and slates, which contain auriferous quartz-ledges. These, by decomposition and erosion, have yielded their gold to the placer-gravels of the gulches. As the whole exposed area of these rocks is but 900 square miles, and the cañons emerging from them speedily lose themselves in the later formations, assuming a gentle grade, and as the erosions producing auriferous deposits have been wholly those of the present water-courses only, it is evident that no such deep and large accumulations of "pay-gravel" as those which characterize the western flank of the Sierra in California, or even the western side of the Rocky and Bitter Root ranges in Montana and Idaho, are here to be expected. The Black Hills are inclosed, as it were, between the north and south forks of the Big Cheyenne; and the small tributaries of these streams offer the only gold-washings. Districts have been created and explored on eight or nine of these creeks and gulches; and after carefully perusing the impartial report of Mr. JENNEY'S working tests, and the records which he gives of the experience of other prospectors, we must confess that the outlook for a new Eldorado is uncommonly poor. The best results reported are (as might be expected) given in letters from miners, received by Mr. JENNEY since he left the region; though in several instances, and notably on Spring Creek, he found gravel, apparently in very shallow layers, yielding as much as $11.25 per cubic yard "in places." All the samples brought back by him from the quartz-ledges turned out upon assay, with unpleasant uniformity, to contain no gold, or so little that it could not be weighed by the assayer. The gulch gold, what there is of it, is 946 fine, exceeding the average of California. Mr. JENNEY speaks favorably of the conditions for cheap mining, and of the prospects of a number of the districts; but his final conclusion is somewhat of a damper. He says: "There is gold enough to thoroughly settle and develop the country, and, after the placers are exhausted, stock-raising will be the great business of the inhabitants, who have a world of wealth in the splendid grazing of this region." This is damning with faint praise.

Meanwhile, the present business of the inhabitants is saving their scalps from the Indians. Of course, we must approve the determination of the Government to protect the lives of citizens, even though, by disobedience to express proclamation, they may have forfeited their claim to protection. But we think the blood that has been, and will be, shed in this affair too great a price for the booty sought; and we trust the follies of the past will not be crowned with an expensive purchase of the Indian right to the Black Hills.

THE EXPLOSION AT THE MIDLOTHIAN COLLIERY, VA.

OUR sensational contemporary, the New York *Herald*, on the 22d May had a report from Richmond, Va., giving the particulars of an explosion of fire-damp, that occurred on the previous day, and which resulted in the loss of eight lives. The telegraph report attributed the accident to "carelessness and penuriousness on the part of the managers in failing to provide proper means of ventilation," and it further stated that Mr. HEINRICH, the Superintendent, "was so overawed and confused by the surroundings that he seemed to lose all presence of mind, and, like every one else, was totally helpless."

Mr. HEINRICH took prompt measures to justify both himself and the proprietor of the mine from these slanderous statements, by immediately calling on the judge of the County Court to make an official investigation into the cause of the accident, with the view of fixing the blame where it belongs.

We congratulate Mr. HEINRICH upon his prompt defence, and upon the very flattering terms in which Judge CLOPTON disposes of the injurious insinuations as follows:

JUDGE CLOPTON'S OPINION AS TO THE CAUSE OF THE EXPLOSION.

To A. G. ELAM, Esq., J. P.:

SIR—Having yesterday made an investigation into the circumstances attending the late explosion at the "Grove shaft," Midlothian, with a view to the propriety of laying the same before the next Grand Jury, I have arrived at the following conclusions:

1st. That the 12-feet level, or "big stall," is subject to irregular "blowers" or "feeders," which at times discharge large quantities of carburetted hydrogen, and at other times much smaller quantities of the same gas.

2d. That CORNEAU, the gas-man, had tested the level up to the head of the working with his Davy lamp, and on his return, with his open lamp lit on his cap, he met the discharge from one of these "blowers," which fired the gas hanging in the ceiling and around the "collars" of the level.

3d. That the hot, sultry weather and low barometric state of the atmosphere on that day, prevented as free a circulation of air in the level as had been kept up in the cooler weather previous, and also permitted considerable expansion of the gas. In my opinion the neglect of the gas-man to note this state of the atmosphere was, most probably, the prime cause of the explosion. I am further of opinion that until the ventilation by the fan now being constructed is established, it will be unsafe to work the twelve-feet level with the door and upcast leading into the California drift open; and also, that there should be a barometer at the "pit-head" of all deep workings, from which the "top" and "bottom" bosses should frequently take observations.

There can be no question of the skill and practical knowledge of Mr. HEINRICH as a mining engineer, and his tender care of the men under his charge. The testimony I have heard establishes this beyond a doubt, and the works now standing at the "Grove shaft" are a monument to his skill as a mining engineer. I am satisfied that after the explosion he did everything for the rescue of the men in the shaft, which could be expected of any one, and that he was no more excited than was to be expected under such appalling circumstances. In fact, it was proven that everything was done with greater dispatch and less confusion than on the occurrence of any former explosion in the same coal-field. I see no occasion for placing this matter before the Grand Jury, and it will therefore be unnecessary for you to take any further steps.

Very respectfully, etc.,

May 27, 1876. WILLIAM I. CLOPTON.

The description (which will be found on another page) of the improvements at this mine, contained in a paper read before the Institute of Mining Engineers at Washington in February last, shows that so far from there having been any "penuriousness" on the part of the management, the Midlothian Colliery is worked in much the best manner and with the finest "plant" of all collieries ever opened in Virginia, and indeed there are few in any part of our bituminous fields that can compare with it. The complaint, if any were to be made with the present management, should certainly not be of "penuriousness." Mr. HEINRICH'S carefully-matured plans comprised the sinking of a second shaft—not yet required by the laws of Virginia—and he had prepared for a very thorough ventilation of the mine by the erection of a Guibal fan 23 feet diameter, 7 feet face—one of the largest and best yet built in this country. This ventilator was within three days of completion when the accident occurred. It has since been put to work and is giving excellent results.

The real cause of the accident was, doubtless, primarily the existence of sudden outbursts of gas in the mine, and secondly, carelessness on the part of some of the unfortunate men who lost their lives.

There is every reason to believe, that the mine was managed with care and intelligence. We may remark, however, that no mine should be without "special rules," made familiar to every employee working therein, and specifying clearly what each must and what he must not do, to insure the safety of the mine, and that such rules should be strictly enforced. It did not appear in the investigation that any such rules exist in this case, and it is very evident that, working with open lights in that part of the mine which is subject to "blowers" or sudden outbursts of gas, should not be allowed. The recommendation of Judge CLOPTON, that the mine be provided with a barometer, is certainly good, for no fiery mine should be without one, but the thorough instruction of the workmen in their duties, by the establishment and strict enforcement of a few judicious rules, is one of the most efficient preventives of so-called accidents. These remarks have so general an application, that we can safely let them stand, though they may not be applicable in this particular case.

INTERNATIONAL EXHIBITION OF 1876.

Special Report of the Engineering and Mining Journal, No. 4.

THE Exhibition is now said to be paying running expenses and a little more. The admissions for the week ending May 30th, were as follows:

ATTENDANCE AT THE EXHIBITION.

Date.		Paying Visitors.	Press, Complimentary, and Exhibitors.	Total Visitors.
Previously reported		218,208	108,361	326,569
May 24	13th Day	20,530	13,652	34,182
" 25	14th "	19,821	11,335	31,156
" 26	15th "	16,792	11,327	28,119
" 27	16th "	20,091	11,691	31,782
" 29	17th "	16,202	11,265	27,467
" 30	18th "	41,111	11,542	52,653
Totals		352,755	179,173	531,928

The Judges in the various sections have been divided into sub-committees, and during the past few days have examined, in a general way, most of the exhibits.

Those who have goods for competition have been required to fill out blanks stating the nature of their exhibits, and the grounds on which they claim awards. Many of the answers relating to the claims made, have been of such a nature that the Judges have found it necessary to ask for more light, and in consequence, some delay in arriving at decisions may ensue. A few of the exhibitors have, with becoming modesty, put their claims in such a manner that, to satisfy them all, the mint will be severely taxed to turn out a sufficient quantity of medals. In Group I. most of the Judges are at work every day, and the metallurgical and mining exhibits have been pretty well looked over. The labors of this group have been much increased by the addition of several classes such as marbles, building stones, etc., which formerly belonged to another group.

The Main Building continues to attract the largest proportion of the visitors, which fact, considering the variety, and, in many cases, the great intrinsic beauty of its contents, does not seem strange. The countries which were behind hand at the Opening Day, seem to find it very hard to get well finished, and it seems now as though the erection of cases, and the arranging of goods, would continue to the end of the Exhibition.

One very important change is to be seen on the exhibits of nearly all the nations. That is the putting on show cases, etc., of labels, which describe the character of the exhibits. This is a great blessing to those who have to depend on the official catalogue for what they want to know, for it is daily proving itself to be too brief and unreliable to answer as a visitor's guide. The new edition, it is promised, will be much better. Machinery Hall seemed, a few days ago, to be about in perfect order, but the arrival at last of the big fifty-six ton Krupp gun, has thrown the east end of the building into almost as much confusion as if it had sent a shell in its place. Nearly all the German Department has been cleared of its exhibits, and the floor covered with heavy joists, on a portion of which rests the iron siege carriage which is to carry the gun. This was brought in on a car, from which it has been raised by means of a derrick constructed of wrought iron lattice work. This derrick is one specially made for the handling of these heavy guns. The gun itself is lagged in wood, and will require much polishing before it will look as bright as it did before leaving Essen. Now that KRUPP'S other goods have been nearly all unpacked, there is some disappointment felt that a greater variety of his manufactures has not been sent here.

The French have found room in Machinery Hall, for the small metallurgical exhibit which comes from their country. The Marseilles Blast Furnace Company, have sent about twenty very fine specimens of manganiferous pig iron, containing from eight to sixty per cent. of manganese.

The main railroad track running through the building has been partially removed, and the space floored over, from which it would seem that the long-suffering patience of the Commission, with the dilatory exhibitors is about at an end.

N.

THE INTERNATIONAL EXHIBITION BUILDINGS.

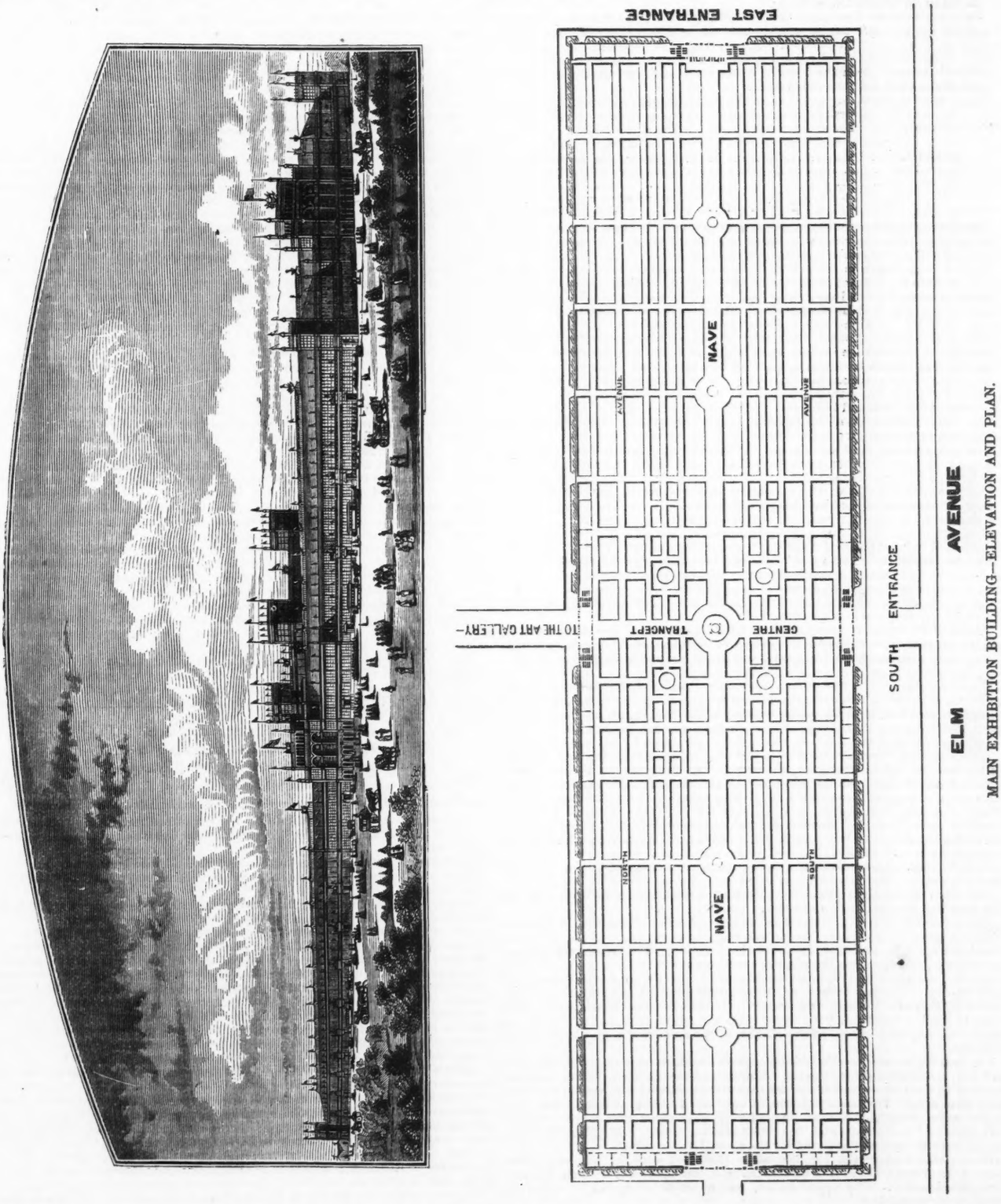
Written for the Engineering and Mining Journal, by John A. Wilson, C. E.

I.—THE MAIN EXHIBITION BUILDING.

THIS building is located at the southern extremity of the Centennial grounds, parallel with, and one hundred and seventy feet north of, Elm Avenue, it is East of Belmont Avenue. It forms a rectangle of 1,880 feet in length, and 464 feet in width, measured between centers of exterior columns. The general arrangement is a central nave, lengthways of the building, of 120 feet span, outside of which are two passages of 48 feet span, then two side avenues of 100 feet span each, supplemented by passages of 24 feet span, making the total width of 464 feet. The building is constructed in what may be termed the utilitarian style of Architecture, as the necessity for great economy required the omission of everything in the way of ornaments that would add to the expense. No additions were allowed for architectural effect, and every foot of the building is utilized for Exhibition purposes.

In order to break the great length of the roof, a cross transept was introduced at a distance of 976 feet from the east end—which transept consists of one span of 120 feet, two spans of 100 feet, and two spans 48 feet, in all 416 feet.

The spans of 120 feet, in both nave and transept have a height to square of 45 feet, and to ridge of 70 feet. The intersection in the center of the building form a square of 120 feet which is raised to a height on square of 72 feet, and at ridge of 98 feet 6 inches, and which is spanned by diagonal trusses.



MAIN EXHIBITION BUILDING—ELEVATION AND PLAN.

The 48 feet spans on each side of the main nave, have a height to square of 27 feet 6 inches, and to ridge of ventilation of 34 feet 2 inches, and the intersection of these with the similar spans in the transept, produce four interior courts of 48 feet square, at the four corners of the central square, on which courts are constructed square towers which rise to a height of 120 feet. The effect of

this arrangement is to break the dead line of the long roof by a central raised portion 184 feet square with the four towers.

The 100 feet spans in both nave and transept, have a height to the square of 45 feet, and to ridge of 65 feet. The intersections of these avenues with the other avenues at the center of the building, produce four spaces of 100 feet square and four spaces 100 by 120 feet, which are covered by square roof trusses in one direction, with supporting trusses from the corner columns in the other direction. The 24 feet spans have a height to square 22½ feet. The main central nave, has an interior length of 1,832 feet after deducting the spaces used for entrances, and this is the longest avenue of such width (120 feet) ever introduced in an Exhibition building.

There are four main entrances to the building, viz. : one at each end, with a length of 216 feet, and one at each side, at the middle of the building, with a length of 416 feet. The eastern entrance will be the approach for carriages, the western one that from the Railway station, the south entrance will be the principal approach from the lines of street cars, and the northern entrance will communicate with the Art Gallery.

The space for exhibiting goods is entirely on the ground floor. There are upper floors in the towers and over the main entrance, which are devoted to offices and galleries. The areas covered by flooring are as follows :

	sq. feet.		acres.
Ground floor	872,320	=	20.02
Upper floors	37,344	=	0.85
Towers	26,344	=	0.60
Total	936,008	=	21.47

The four central towers are connected at top with bridges over the roof of the building, all the towers have stairs, and two of them are provided with elevators. This will enable visitors to have a good view of the grounds.

Under each column in the building is a pier of masonry founded at a depth of six or more feet below the surface of the ground. These piers are of good rubble masonry laid in lime mortar, and capped with a granite block, one foot thick, which is drilled for anchor bolts. Between the piers round the outside of the building, are foundation walls two feet thick, and four feet deep below the natural surface of ground. These walls are capped by a base course of dressed stone eight inches by ten inches, upon which is built, to a height of six feet from the floor of the building, brick-work in ornamented patterns of red and black, pointed with colored mortar. The iron columns are built in this brick work. The four main entrances have stone sides, between piers and side jambs of ornamented brick and tile work, encircling the columns.

The entire framework of the building is of wrought iron. The vertical columns rest in the masonry at the bottom, and are connected and braced to each other by beams and wind trusses, and carry the wrought iron roof trusses, which are connected by the ridge members, and necessary braces and ties. Provision has been made for resisting the heaviest wind pressure. The two outer rows of columns are fastened to the foundation masonry by anchor bolts ; the interior columns rest on cast iron bases, which have lugs let into the cap stones on the piers. Under the columns which support the central towers, sheets of lead are placed to insure even distribution of the load. The wrought iron is specified to be of the best quality, tough and fibrous, and free from cracks and flaws along the edges ; that used in tension members to be *double rolled*, and capable of standing an ultimate stress of 55,000 pounds per square inch; that used in compression members to resist, in short prisms, an ultimate compressive strain of 50,000 pounds per square inch, and with no permanent set under 25,000 pounds per square inch.

The load for which the roofs are calculated, is 35 pounds per square foot of horizontal surface, exclusive of the weight of the structure, the limiting strains for wrought iron being, for tension 10,000 pounds per square inch, for compression in short prisms 8,000 pounds per square inch.

There are three styles of columns used, according to their positions in the building, viz., those made of two channel bars, eight or ten inches, according to section required, with flat plates rivetted to the flanges, forming a rectangular hollow column ; those made of four ten inch channel bars, with angle irons rivetted at the corners ; those consisting of single ten and a-half inch I beams.

Cast iron heel blocks are used to connect the columns with the roof trusses. In the 100 feet and 120 feet span, the trusses are designed on the triangular system with straight rafters composed of two channel bars 6, 9, 10, or 12 inches deep, as required, connected by plates rivetted to the upper flanges. The struts are made of two channels or pieces of flat bar iron, as required, bowed out from each other, and rivetted through distance pieces. The tension rods are of flat bar iron with upset ends, drilled with holes for pin connections, excepting the main horizontal tier which are round in section with sleeve nuts for adjustment. The members of these trusses are connected by pins or bolts, as is necessary. The diagonal roof trusses in the center of the building are constructed on the same principal, with such modifications of details as the conditions of the case made necessary.

The trusses for the 48-feet spans are straight, double intersection, triangular girders ; those for the 24-feet spans are sloping triangular trusses—all composed of angle, T, and plate irons rivetted together. The same style of construction was adopted for the wind trusses which connect the columns longitudinally, the upper and lower members being connected by vertical struts and cross-braces. The two rows of columns forming the 48-feet avenue are connected by tie rods 1¼ inches in diameter. Lateral bracing, consisting of rods 1¼ to 1⅛ inches diameter, with sleeve nuts for adjustment, is introduced at points—as required—between the rafters of the roof trusses and between the columns.

The four main entrances have intermediate cast iron columns, with brackets and lamps, and wrought iron gates. Spiral staircases of wrought iron are constructed in the towers, and there are two wooden stairways at each of the four main entrances. The main entrance fronts are finished at the corners and angles with octagonal towers covered with galvanized iron above a base of cast iron, and the ornamental face work of these fronts is of galvanized iron for the heavier portions, and zinc for the more delicate details.

The outside walls of the building above the brick work, as well as the portions of the fronts above the galvanized iron, are made of wooden framing with glazed sashes. The upper sashes, which are circular, can be opened at pleasure for ventilation.

The roof covering consists of spruce purlins, 3 inches by 14 inches, fastened to the rafters by angle irons, on which are placed the sheeting boards of spruce, one inch thick, laid closely, and dressed on the upper side, above which is the covering of best quality of I. C. roofing tin. Great care has been taken to prevent any leaking of the roof, and the drainage is carried to the ground by conductors 4 inches square, which connect with tile pipes under the building.

Ventilators and skylights framed of wood, with glazed sashes are placed on various portions of the building, the ventilation sashes being arranged to open or shut from the ground floor by the use of cords. The sashes throughout the building are 1¾ inches thick of white pine wood. The exterior cornices are finished with wooden moldings and balustrades. Flagstaffs are placed over all the main columns, and trophies over all the entrances.

In order to give a firm surface, and avoid danger from fire, the ground floor consists of hemlock sills 3x8 inches, laid broadside down, and two feet apart between centers, with clay solidly packed between the sills, and level with their upper surface. On this is laid yellow pine plank 1½ inches thick, and not over 8 inches wide. The short space of time during which the flooring will be needed allows of this method of construction. Boxes are provided at intervals under the floor to hold the sweepings. On the lines of columns the ground sills are made 3 inches by 12 inches, placed on edge, to give sufficient stiffness for any partitions that may be needed for exhibition purposes. The upper floors of offices and galleries in the towers have joists 3x14 inches, placed 16 inches between centers, and covered by 1½ inch pine flooring boards not over 6 inches wide.

As it is not the intention to keep the Exhibition open at night—the gas supply has been arranged only with reference to the necessary care and watching of the building. There will be four reflectors with 50 burners each in the central pavilion ; a number of reflectors with 30 burners each in the various aisles, and sundry other fixtures—making in the aggregate about 7,000 burners. The gas mains are 8, 6, and 4 inches wide, according to position, and the total amount of wrought iron gas pipe in the building—varying from 4 inches down to ¾-inch diameter—is about 32,150 feet, lineal.

The water supply is furnished from a 12-inch main at the western end of the building—which connects with three mains (one 8 inches and two 6 inches) running lengthwise of the building. Outside of the structure there are 36 fire-plugs, and inside 77 hydrant valve-plugs below the level of the floor, all so distributed as to be most effective in case of fire. The approximate amount of pipe, varying from 12 inches to 4 inches in diameter, is 12,760 feet, lineal.

Waiting and retiring-rooms have been provided for both gentlemen and ladies. Water-closets have been introduced into eight different rooms on the ground floor ; and including the offices on the second floor, in towers and entrances, there are 152 permanent wash-basins.

The drainage system consists of a main city sewer on Elm Avenue parallel with the building, from which one brick sewer, 30 inches in diameter, and five lines of 18-inch terra cotta pipe lead into the building. In addition to this there are two 3-feet brick sewers connecting with the Park system of drainage, which assist in carrying off the roof water. Branches of terra cotta pipe from 15 inches to 6 inches in diameter are distributed over the area of the structure, making a total of 800 feet, lineal, of 30-inch brick sewer, and about 14,150 feet, lineal, of terra cotta pipe.

The exterior of the Main Exhibition Building is painted with three coats of white lead in oil—the general tint adopted being a buff, shaded dark in places, and relieved by bright colors in the chamfers. The trophies—flag-staffs and other ornaments, are painted in bright colors and gilded, and the various moldings, spandrils, etc., are ornamented in gilt and fancy colors, and with stencil work.

Inside the building the woodwork of the roofs is kalsomined, of a bright pearl color, in two coats, and decorated by stenciling. The ironwork of the under spans of roof trusses is painted in buff and crimson, relieved by blue and gold. The side work is painted a light olive-green, with ornamentation in crimson, blue, and gold. The columns are decorated in various colors. The movable circular sashes are ornamented with figures and emblems, which are printed on muslin, and are produced very cheaply, but which give the effect of stained glass.

Partitions, screens, counters, show-cases, etc., are constructed by the various exhibitors, as may be necessary for properly showing the goods, and a description of these is not in place in this article. Offices for the various foreign commissions will be partitioned off, as may be found desirable, from the 24-feet spaces on either side of the building.

THE MIDLOTHIAN, VA., COLLIERY IN 1876.*

By Oswald J. Heinrich, Superintending Engineer.

IN the coal review for the United States for 1875, the ENGINEERING AND MINING JOURNAL, January 1st, 1876, remarks about the Richmond coal basin :

"It has contributed but little to the supply of fuel during the year past, notwithstanding the fact that it is the most favorably situated of all our coal fields, and possesses a fuel of good quality, well adapted to many important uses. An unaccountable lethargy seems to have fallen on all who have touched this field; and yet, in the future it can scarcely fail to become one of the great sources of coal supply."

In most respects indorsing the above remarks, I take occasion to lay before the Institute the following facts in defense of the Richmond basin.

Not willing to criticise other mining enterprises in this field, I will only make this one remark in general for all of them. While it is true that very little coal has been raised during this year in this field, it is equally true that even what little has been raised could hardly be sold. When the output of the largest coal districts in the United States decreases, in consequence of the state of the market, it is not to be wondered at that the former small output of this basin dwindled down to almost nothing. But a far deeper seated evil, under which this field is suffering, may be discerned from the following remarks which, I hope will show that the latter part of the above remark in the JOURNAL, is not altogether fair.

If little has been said about it formerly, the reason is the rather conservative character prevailing here—not to do too much, and say still less about it.

As the history of one mine in this district very nearly represents the history of the whole field, I will endeavor to give an account of the development of the Midlothian Mines, ranging amongst the oldest in the district, partially taken from a report of Col. WOOLDRIDGE, in 1841. Coal was mined in this neighborhood as early as 1700, and used (then so-called extensively) in the vicinity in 1775. A foundry in Richmond employed it during the Revolution to make shot and shell, and in 1789 the coal was sent to Boston, Philadelphia, and New York. The oldest mines discovered in this neighborhood were the old Black Heath pits, Buck & Cunliffe's, Ross & Currey's, lying northeast of the Midlothian. Wooldridge's, Bailey's, and the Green Hole pits, now owned by the Midlothian Mines ; also nearer James River, Trabue's and Sallis pits, all in Chesterfield County.

In 1841, the Maidenhead pits (Black Heath Company), discovered in 1821,

* A paper read before the American Institute of Mining Engineers, at the Washington Meeting, February, 1876.

were the principal openings. Formerly worked by Col. HEATH, they were sold in 1840 to English capitalists, and taken possession of by the same in 1841, under the name of the Chesterfield Coal and Iron Mining Company. Considerable work was done by that company, and a good deal of coal raised until, in 1852, by the bad management of their agent, the company got tired of mining and stopped, at least upon a larger scale. The ground was afterwards leased by the Midlothian Company, and worked to a very limited extent, and is now still owned by the Chesterfield Coal and Iron Mining Company. The mines adjoin the Midlothian Mines, and are in the same basin.

Previous to 1841, a number of old pits, the Union, Mill's, Green Hole, and Creek Company pits were worked, but did not last more than 12 or 15 years, each at a limited production; but in all of them a good deal of the coal had been left behind, as was proved by other parties entering the same ground afterwards.

The Midlothian Coal Mining Company was organized in 1836, but the sinking of the shafts preceded the organization of the company. The original tract consisted of 404½ acres. The company was organized by issuing 3,000 shares at $100 each; one-third was sold to some thirty shareholders, by which $100,000 were raised and expended in sinking shafts, procuring a sixty horse-power engine and boilers, purchasing mules, and building a number of houses.

Four shafts were commenced by this company, and sunk in time to various depths. The old pump shaft, 777 feet deep (716 feet to the coal), the middle shaft 625 feet deep (612 feet to the coal), the wood shaft, 625 feet deep (probably 250 or 300 feet to the coal, and the Grove shaft, 622 feet deep (485 feet to the coal). In late years another shaft was carried down 1,015 feet, and bored 322 feet below the shaft bottom, but no coal was found. It is the shaft furthest west from the eastern outcrop in this field.

In the fall of 1839, coal was struck in the pump shaft at 716 feet, the coal being 36 feet thick. At that time the other shafts were temporarily abandoned, being 625 feet, 300 feet, and 85 feet deep. In 1840, 300,000 bushels of coal were raised from the pump shaft, the force employed being about 150 men, and twenty-five mules. The capacity of the work was rated to be 1,000,000 bushels per annum. The area of ground occupied by these old pits in the main basin is about 84 acres, with average thickness of coal, say 20 feet, it being as thick as 50 feet in places.

In 1855, a serious explosion occurred, killing about fifty-five men. At that time the lower works, gained by an incline, became precarious on account of a heavy influx of water from the old mines (Chesterfield Coal and Iron Mining Company) north-east of Midlothian from which the water had been tapped.

In December, 1856, attempts were made to tap the water from the old White Chimney Works, to the rise, to gain new ground; by miscalculation, having no maps, the water broke through, flooding the pit and drowning a number of men. In 1858, a 500 horse-power Cornish pumping engine was put up to drain this ground. Although the bottom of the shaft was gained, the mine took fire, and after another attempt to regain the lost ground in 1861, all lower works had to be abandoned, leaving a column of pumps, a train of loaded cars, a fire engine, etc., behind in the hasty retreat. During the late war, raising coal in large quantities was confined to the rise works about the White Chimney shaft. Already, previous to the war, a new shaft had been commenced about 825 yards west of the old pump shaft, and carried at various times to a depth of 1,015 feet. After the war, this work was recommenced, and 322 feet bored below the shaft bottom without finding the coal. The company's financial affairs being in a precarious state, several attempts were made to re-open some of the old works, without success, until in 1867 it finally failed, being involved in debt about $180,000. The property was sold, and was purchased by the present owner, and is held by him now, under fee simple, after a prolonged lawsuit during five years. The first four years after he gained possession were spent in working out some of the old ground nearer the outcrop.

A description of those troublesome times was rendered to the Institute at the Boston meeting in 1873. After the coal of that ground had been exhausted to the level of drainage by the first column of the pump in the pump shaft, the serious question arose: What next?

But two courses were open. Either an attempt should be made to enter the old deep works of the pump shaft, or explorations should be made for the continuation of the basins formerly known, in new sections of the property.

In regard to entering the old works, the following facts had to be considered:

1. What amount of coal has, probably, been left behind?
2. In what condition were the old works when abandoned?
3. What was the probable quality of coal to be obtained?
4. What was the prospect of a regular supply of such coal?
5. What would be the probable expense of the undertaking?
6. What was the prospect for succeeding at all, or, at least, at remunerative figures?

Subject 1.—The section of land of that part of the old basin in which the pump-shaft is located, contains about 84 acres of coal surface, upon an assumed general line of pitch of 25° to 30°. The probable average thickness of the coal assumed to be 21 feet; the amount of coal contained per acre in said ground, in round figures, may then be taken at 33,880 tons (taking 1 cubic yard per ton), or, in the whole ground, 2,845,920 tons of 2,000 lb. Allowing one-fifth for disturbed ground, it would leave 2,276,736 tons of coal. From the above statement it will be seen that the life of the pit has not exceeded twenty-five years, of which, at least, twelve or eighteen months for work were lost in consequence of accidents. The greatest capacity of the pit, as formerly stated, being 1,000,000 bushels, equal to 35,000 tons per annum, a production most probably never realized at any time, would make a production, in twenty-three working years, of 805,000 tons. From the best information, probably 600,000 tons have been raised, which would leave 1,676,736 tons of coal yet in the ground, partially in solid spots, but mostly in the old pillars 60 feet square, in which the works had been laid out. By judicious work, probably two-thirds of it might be obtained, or, in round numbers, about 1,000,000 tons. At a moderate valuation of twenty-five cents profit per ton, the net earnings may be estimated then at $250,000, which may yet be realized from this ground.

Subject 2.—From all evidences of living and trustworthy witnesses, the condition of the works were in a very critical state when abandoned. Parts of the lower works had been badly pillaged. The main shaft pillars greatly weakened, so that all but the pump-shaft have now caved in. Even higher up in said shaft, large breaks have occurred, bringing the shaft out of plumb. The shaft being formerly divided in a double hoist and pump chamber, it could now be only redeemed for either one or the other.

Subject 3.—While formerly the coal from these works was of a first-class quality for gas coal, the constant crushing and various exposures by spontaneous combustion have, unquestionably, deteriorated, a good deal of it for various purposes, making it particularly unfavorable for distant transportation and rehandling, a fact which has been fully demonstrated. While it might answer well enough for our home markets, it could not well enter the market for shipments North, which must be the main dependence of the future, as it has been in former years, for those mines.

Subject 4.—It will be evident to any person familiar with coal mining that in such ground, once or twice partially past over, no regularity of supply could be obtained. Passing through the old pillars, or robbing them when retreating, would afford a tolerable and ultimately a more regular supply. Passing the old gangways and tumbled ground, would make plenty of rubbish and still more dead work. To-day, coal; to-morrow, rock and dirt, and the next day still something else, would be the order of the day, as has also been fully proved.

Subject 5.—To give an answer with reasonable accuracy from what is known of this old pit, as regards the expenditures to redeem it, is almost beyond the calculation of any one except those who have gone through it. If such is the case it may be roughly guessed at. To do so it would be indispensable to take into consideration that the following items had to be accomplished: 777 feet of shaft cleaned out, retimbered, and, if used for a pump shaft, 3 columns of 16-inch pumps put in. About half of the old columns would be available, the pumping-engine being still in place; 500 feet of shaft for an upcast, to be cleaned out and retimbered; from 1,000 to 1,200 feet of incline regained and a donkey pump put up at shaft bottom to drain the water from below it; about 1,000 feet of connection to the rise towards the upcast shaft to be made, and the necessary engines for hoisting, and fixtures for raising coal to be put up; from 15 to 18 months of pumping with a 500 horse-power engine would be required to drain the pit, the expense of which item alone would be about $10,000 to $12,000. With the conviction that on entering the mine spontaneous combustion would have to be guarded against, the delays in cleaning out rubbish, retimbering, and all the perplexing incidents met with in such an enterprise, it is easy to see that $100,000 would not be too high an estimate to make a job permanent enough to last until the coal was extracted.

Subject 6.—The former history of this pit having fully proved that a large quantity of water, much gas, and plenty of spontaneous combustion would be encountered, it was self-evident that by using one shaft only—the pump shaft—there was no prospect of maintaining the pit at all for any length of time, and, moreover, the life of every man in the pit would be endangered. To make the long connection with the upcast would be also a most hazardous undertaking, to be accomplished only with great difficulty and expense. But if even all this were successfully accomplished, it would be necessary by driving out from either side of the shafts to maintain a long line of timbered ground, which, in many instances, would have to be protected against spontaneous combustion, all at a great cost, and under the constant necessity of repair. If the desired extremity of the pit were successfully reached in the course of years the chances were that fire in the rear would cause a regular stampede, leaving behind half, if not all, of the machinery, pumps, rails, wagons and all the requirements necessary to raise coal. When the above points, hastily stated, are seriously considered they call for careful deliberation and sober council. Such, then, was the case when a second proposition was made (the above plan being really recommended by those who *profess* to know a great deal about mining), namely, to aim at both.

1st. To get this property in working order again, and to make it productive, by sending its superior coal to the great market of the North.

2d. To redeem, if possible, and at some reasonable figure, the yet valuable ground described above, with some prospect of success, it was recommended to go into new ground adjoining, not infected with the sins of our forefathers in mining, which are at the bottom of all the evils existing in this section of country—and by the by in many others.

Accordingly explorations by boring were commenced in April, 1873, and, after sufficient evidence had been collected, the cleaning out of a shaft, the "Grove shaft," south of the old works, was commenced. Although it was well known that this shaft was located in troubled ground (having been sunk to coal 485 feet and 622 feet to the bottom by the old company, and only 4 to 6 feet coal reported) still it was considered to be the only shaft available, and giving evidence that coal could be reached sooner from it than by sinking a new shaft—which has been actually proved. Furthermore, the location of this shaft to the rise of the deep works, if the basin continued further south from the old pump shaft, made this an available point to test this ground, and it would serve afterwards as the regular upcast for the deeper works. Coal was found by two bore holes to the dip of this shaft, in one instance at 477 feet, in the other at 598 to 608 feet. The latter point being 595 feet west of the shaft proved the existence of three seams of coal 14½ feet, 12 feet, and from 3½ to 4 feet thick. The two larger seams were divided by slaty benches, which frequently is the case in this field. To reach these points it was necessary to crosscut the stratification, particularly as a narrow basin existed nearer to the shaft, both points being therefore opened out by such a tunnel. Since May, 1873, exclusive of six months cessation during the beginning of the financial crisis, work has been going on to complete the winning of this new pit, and the erection of the surface structures, and early in January, 1876, the first coal was shipped.

The following work was required to get into operation:

1. Cleaning out and re-timbering 622 feet of main shaft, 11x11 feet providing the same with an air-tight brattice, as only one shaft is now available to operate the pit.

2. Cleaning out and re-timbering 180 feet of a jacked pit; to raise the surface waters, and putting in an Allison & Bannan steam-pump of 160 feet column, 6-inch diameter, with a 6½-inch steam cylinder; 4½-inch plunger.

3. 858 feet of rock tunnels driven (20 feet landing, 12x16 feet; 75 feet, 10x7 feet; 828 feet, 8x7 feet wide); 198 feet driven through disturbed ground; 250 feet old rock drifts cleaned and widened out; 230 feet incline cleaned out and timbered; 492 feet of gangway driven and timbered in various seams, from 4 to 12 feet, and 112 feet in inferior ground.

4. 136 feet of return air-course to engine-house, near top of shaft, driven through loose ground, and walled and arched in brickwork.

5. New engine-house erected, 43x50 feet; also new boiler-house, 50x50, and a fan-house for a 23-feet diameter fan, 7 feet wide (system, GUIBAL), all in solid rubble masonry. A waste-bank, 210x64 feet, 12 feet high, encased by solid masonry, and a brick chimney, 18 feet base, 56 feet high erected.

6. Pit-head of 30x20 feet base, 70 feet high from floor of engine-house, and also a platform of 88x62 feet, 19 feet high in front of shaft, put up to convey the coal from the shaft to the various screens upon the landing platform.

7. For the purpose of separating the different grades of coal, slating the same thoroughly, and stacking about 500 tons of coal at the pit, a loading platform of 78x47 feet, 20 feet high has been erected, provided with four sta-

tionary screens, making three grades of coal, permittin the loadigng (hereafter) of twelve hopper cars, of 10 tons capacity at a time.

8. For hoisting purposes a double cylinder direct-acting engine, with link motion, 24-inch cylinder, 5 feet stroke, has been reconstructed from two old engines existing upon the property. They are firmly put up upon a solid foundation of masonry. The capacity of the engine is calculated to be about 130 horse-power. It lifts with great ease 1 ton of coal per minute from shaft bottom (624 feet), including the changing of cars. At present only one platform cage is used, allowing only ½ ton to be lifted at the time, but provision is made to use double platform cages.

9. To run the fan and some auxiliary machinery, a steam-engine, 14-inch cylinder, 30-inch stroke, will be put up soon in the same engine-room.

10. A battery of four new boilers, 42 inches diameter, 24 feet long, with center and side flues, have been put up, permitting a very economical use of fuel, using, by experimental trial, only 2,100 lb. of coal in 24 hours, during a week's trial upon measured coal. Space is also provided for a second battery of plain cylinder boilers (now on hand) in the same boiler-house, if needed. The exhaust steam circulates in a heater, through which the feed water passes in a series of pipes, after being drawn from a pond (also newly made), by the steam donkey-pumps.

The coal for engine purposes is delivered directly from the shaft to a coal-house adjoining the boiler-house, whence it is brought on a small tramroad in front of the boilers, and upon this same road the ashes are conveyed up to the waste-pile in rear of the boiler-house.

The capacity of the work is such that whenever the pit is extensively opened out, 500 tons of coal in 12 hours could be raised through the shaft, and, by the extension of the loading platform, separated ready for shipment.

Accordingly, the first part of the programme is so far completed, that the new ground has been gained. To perfect it in future, and regain if desirable the old ground of the pump shaft work, the following plan is proposed. After fully ascertaining, by a series of boreholes, the continuation of coal at the level of the lowest works in the pump shaft, a new deep shaft (probably 900 to 1,000 feet), to be used as a pump shaft for the new and old ground, has to be sunk about midway between the termination of the old works, and the boundary line of the property. From the bottom of such a shaft in connection with an incline to be started from the present new works, the complete ventilation of the mine can be secured.

If then it is deemed advisable to take up the old mine, the north bottom level should be turned off into the roof of the coal at a distance sufficiently far from the old works, to secure a strong safety pillar (never to be holed into hereafter), and after passing this pillar a sufficient distance to the north, the rock drifts to be changed again to enter the old works at its lowest points. During this time, the old pump shaft could be retimbered between the old timber at less expense, and made use of as an upcast and hoist shaft. Extending now the bottom works to the extremity of the north boundary of the property, where most of the solid coal is left behind, a regular homeward work could be carried out at less cost in maintaining back ground, and with more assurance of protection against spontaneous combustion by working separate sections clean out as far as possible. Precarious or too much pillaged ground could be skipped over in the retreat, and cut off more effectually. But if in course of time the pit should be worked out, or prove to be untenable, the rock drift by which the old works were entered, would form a safe ground to cut off forever the old works, and let the water rise without affecting the new ground, and at the same time, relieving the pump of a good deal of labor. Having hastily sketched the outlines of this programme, I refrain at the present from entering into estimates of cost. But it can be easily perceived by the expert, that this plan, although apparently more costly, will at the end, with all its advantages, prove to be the only economical plan, with assurance of success on the one side, and absence of risk on the other. It possesses all the advantages the old ground may afford, and will obviate many of the difficulties otherwise to be contended with.

In conclusion of my remarks, I will only add, that a branch railroad to the main stem of transportation for this mine, namely, the Richmond and Danville Railroad, has been built. This enables a direct line of transportation from the mines to James River at Richmond, or to Westpoint upon the York River, where the largest vessels can float. If the market will permit, it is to be anticipated that this field will show an increased output, provided other mines don't fall back too much. If so, we will see if, by itself, this mine can make its mark upon the market.

OFFICIAL LIST OF JUDGES AT THE INTERNATIONAL EXHIBITION OF 1876.

THE following, for which we are indebted to Prof. W. P. BLAKE, is the only correct and official list of the judges which has yet been published:

I.—*Minerals, Mining, Metallurgy, and Machinery.*

Alexander L. Holley, No. 56 Broadway, New York City.	Isaac Lowthian Bell, M. P., C. E., Great Britain
Prof. T. Sterry Hunt, LL.D., F. R. S., Boston, Mass.	Ernst F. Althans, Germany.
Prof. J. M. Safford, Tennessee.	L. Simonin, France.
S. B. Axtell, Sante Fé, New Mexico.	F. Valton, France.
John Fritz, Bethlehem, Pa.	A. R. Akerman, Sweden.
Austin Savage, Boise City, Idaho.	Ochille Jottrand, Belgium.
W. S. Keyes, M. E., Eureka, Nev.	L. Nicholsky, Russia
Prof. Frederick Prime, Jr., Easton, Pa.	Nicholas Jossa, Russia.
Matthew Addy, Cincinnati, Ohio.	Dr. Th. Kjernulf, Norway.
Prof. G. C. Broadhead, Pleasant Hill, Mo.	Don Daniel de Cortazar, Spain.
	Emanuel Paterno, Italy.

II.—*Pottery, Glass, Artificial Stone, etc.*

Gen. Q. A. Gillmore, U. S. A., N. Y. City.	R. H. Soden Smith, Great Britain.
Arthur Beckwith, New York City.	Dr. G. Seelhorst, Germany.
Prof. E. T. Cox, Indianapolis, Ind.	M de Bussy, France.
Gen. Hector Tyndale, Philadelphia, Pa.	Adolf E. Nordenskiold, Sweden.
Henry Wurtz, Hoboken, N. J.	Mr. Notomi, Japan.

III.—*Chemistry and Pharmacy, with the Apparatus.**

Prof. C. A. Joy, New York City.	Dr. Wm. Odling, F. R. S., Great Britain.
Prof. F. A. Genth, Philadelphia, Pa.	Dr. Rudolph von Wagner, Germany.
Prof. J. Lawrence Smith, Louisville, Ky.	M. I. F. Kuhlman (fils), France.
Prof. C. F. Chandler, New York City.	M. De Wilde, Belgium.
Prof. J. W. Mallet, Charlottesville, Va.	

* In Sections III., V., X., XIII., XV., XVII., XIX., and XXIV., one more foreign judge has yet to be appointed; in Sections VIII., XI., and XIV., two more; in Section XII., in which there will be four foreign judges, the whole have yet to be appointed; in Section IX., two more American judges have yet to be appointed.

IV.—*Animal and Vegetable Products—Machinery.*

Prof. W. C. Kerr, Raleigh, N.C.	Julius Wegeler, Germany.
L. B. Arnold, Rochester, N. Y.	Edouard Martell, France.
Colonel J. F. Tobias, Philadelphia, Pa.	Dr. Nicolau J. Moreira, Brazil.
Colonel John Bradford, Tallahassee, Fla.	M. Jayme Batalha Reis, Portugal.
General H. M. Naglee, San José, Cal.	Ikeda Kenzo, Japan.
Guido Marx, Toledo, Ohio.	E. Oldendorff, Argentine Confederation.
Ryland T. Brown, Indianapolis, Ind.	E. Van Baumhauer, Netherlands.
W. S. Green, Milford, Wis.	H. G. Joly, M. P., Canada.
Decatur H. Miller, Baltimore, Md.	G. F. Secchi-Casali, Italy.
James M. Shaffer, Keokuk, Iowa.	Prof. Th. Segelcke, Denmark.
Don E. Loring, Spain.	

V.—*Fish and Fish Products.—Apparatus of Fishing.**

Prof. S. F. Baird, Washington, D. C.	Joachim Anderson, Norway.
Seth Green, Rochester, N. Y.	

VI.—*Timber, Worked Lumber, Parts of Buildings.*

Prof. Wm. H. Brewer, New Haven, Conn.	John R. West, Chili.
J. M. Bennett, Weston, Lewis County, W. Va.	M. Rodrigues de Vasconcellos, Portugal.
Prof. J. S. Newberry, Cleveland, Ohio.	Hon. W. Skead, Canada.
	Dr. Jose de Saldanha, Brazil.

VII.—*Furniture, Upholstery, Wooden-ware.*

Addison Boyden, Boston, Mass.	Le Marquis de Rochambeau, France.
Chauncey Wiltse, Omaha, Nebraska.	Theo. Snyers, Belgium.
Robert Mitchell, Cincinnati, Ohio.	Francis Thonet, Austria.

VIII.—*Cotton, Linen, and other Fabrics, etc.**

Edward Atkinson, Boston, Mass.	George O. Baker, Selma, Alabama.
Hugh Waddell, Savannah, Ga.	Isaac Watts, Great Britain.
Col. Ed. Richardson, Jackson, Miss.	W. W. Hulse, C. E., Great Britain.
A. D. Lockwood, Providence, R. I.	Don Alvaro T. Gonzales, Spain.
Chas. H. Wolff, Cincinnati, Ohio.	Major A. Goldy, Switzerland.
Samuel Webber, Manchester, N. H.	Prof. Gustave Herrmann, Germany.

IX.—*Wool and Silk Fabrics.—Machinery.**

John L. Hayes, Cambridge, Mass.	Dr. Max. Weigert, Germany.
Elliot C. Cowdin, New York.	Gustave Gebhard, Germany.
Chas. D. Boutillier, Philadelphia, Pa.	M. Chatel, France.
Chas. J. Ellis, 714 Market St., Philadelphia, Pa.	Carl Arnberg, Sweden.
	Hayami Kenzo, Japan.
J. D. Lang, Vassalboro', Me.	John G. Neeser, Switzerland.
H. C. Goodspeed, Salt Lake City, Utah.	August Behmer, Egypt.
Henry Mitchell, Great Britain.	Lourenco Malheiro, M. E., Portugal.

X.—*Clothing, Furs, India Rubber Goods, etc.**

Prof. W. H. Chandler, Ph. D., F. C. S., South Bethlehem, Pa.	Prof. E. N. Horsford, Cambridge, Mass.
	M. Dietz-Monnin, France.
Wm. O. Linthicum, New York City.	Modest Kittary, Russia.
Benj. F. Britton New York City.	Edward Kanitz, Austria.
Dr. George Hewston, San Francisco, Cal.	M. P. Empey, Canada.

XI.—*Jewelry, Watches, Silver-ware, Bronzes, etc.**

Martin P. Kennard, Boston, Mass.	G. H. Heap, Tunis.
Peter Gottesleben, Denver, Col.	

XII.—*Leather and Manufactures of Leather, etc.**

Gov. F. H. Pierrepont, Fairmount, W. Va.	Thomas Miles, Philadelphia, Pa.
John Cummins, Boston, Mass.	J. P. Postles, Wilmington, Del.

XIII.—*Paper, Stationery, Printing, and Book Making.**

James M. Wilcox, Ph.D., Philadelphia, Pa.	H. T. Brian, Washington, D. C.
C. O. Chapin, Springfield, Mass.	Sir Sydney H. Waterlow, Bart., M. P., Great Britain.
Wm. Faxon, Hartford, Conn.	
Edward Conly, Cincinnati, Ohio.	G. W. Seitz, Germany.

XIV.—*Apparatus of Heating, Lighting, etc.**

C. C. Cox, M. D., LL. D., Washington, D. C.	Azel Ames, Jr., M. D., Wakefield, Mass.

XV.—*Builder's Hardware, Tools, Cutlery, etc.**

Charles Staples, Portland, Me.	Hon. J. Bain, Lord Provost of Glasgow, Great Britain.
Daniel Steinmetz, Philadelphia.	
George L. Reed, Clearfield, Pa.	D. MacHardy, Great Britain.
General John D. Imboden, Richmond, Va.	Mr. Diefenbach, Germany.

XVI.—*Military and Sporting Arms, Weapons, etc.*

Col. S. C. Lyford, U. S. A., Chairman Gov. Board, etc.	George A. Hamilton, St. Paul, Minn.
	Major W. H. Noble, R. A., Great Britain.
Gen. H. L. Abbott, U. S. A., Willetts' Point, N. Y.	Capt. Lesne, Belgium.
	Capt. L. F. Saldanha da Gama, Brazil.

XVII.—*Carriages, Vehicles, and Accessories.**

Thomas Goddard, Boston, Mass.	M. Guiet, France.
B. F. Morse, Augusta, Me.	Mr. Duffers, Canada.
B. C. Shaw, Indianapolis, Ind.	

XVIII.—*Railway Plant, Rolling Stock, Engines, etc.*

Robert E. Ricker, Elizabeth, N. J.	Captain Douglas Galton, R. E., C. B., F. R. S., Great Britain.
General T. A. Morris, Indianapolis, Ind.	
Felician Slataper, Pittsburg, Pa.	E. E. A. Schaar, Belgium.
Ernest Pontzen, Austria.	

XIX.—*Vessels, and Apparatus of Transportation.**

Isaac Newton, New York City.	Colonel F. H. Rich, R. E., Great Britain.
J. W. Griffith, Portsmouth, N. H.	

XX.—*Motors, Hydraulic and Pneumatic Apparatus.*

C. T. Porter, Newark, N. J.	W. H. Barlow, C. E., Great Britain.
Joseph Belknap, New York City.	Prof. Reuleaux, Germany.
James Moore, Philadelphia, Pa.	Nicholas Petroff, Russia.
Horatio Allen, South Orange, N. J.	Emil Brugsch, Egypt.
Charles E. Emery, New York City.	

XXI.—*Machine Tools for Wood, Metal, and Stone.*

Irving M. Scott, San Francisco, Cal.	M. le Commandant F. Perier, France.
George H. Bielock, Springfield, Mass.	C. A. Angstrom, Sweden.
W. F. Durfee, Wisconsin.	Auguste Gobert (fils), Belgium.
Prof. John A. Anderson, Manhattan, Kan.	Felix Reifer, Austria.
John Anderson, LL. D., C.E., Gt. Brit.	

XXII.—*Machines and Apparatus Used in Sewing, etc.*

George W. Gregory, Boston, Mass.	L. D. F. Poore, Springfield, Dakota.
Edward H. Knight, Washington, D. C.	Fred. A. Paget, C. E., Great Britain.

XXIII.—*Agricultural Machines, Implements of Agriculture, etc.*

Hon. John P. Reynolds, Chicago, Ill.	Mr. John Coleman, Great Britain.
James S. Grinnell, Washington, D. C.	Don Fermin Rosillo, Spain.
George E. Waring, Jr., Newport, R. I.	P. Don G. Paes Lemé, Spain.
James Bruce, Corvallas, Oregon.	

XXIV.—*Instruments of Medicine, Surgery, etc.**

J. H. Thompson, A. M., M. D., Washington, D. C.	C. B. White, M.D., New Orleans.
	W. Roth, M. D., Germany.

XXV.—*Instruments of Precision, Research, etc.*

Prof. Joseph Henry, LL D., Washington, D. C.
Prof. F. A. P. Barnard, S. T. D., LL. D., New York City.
Prof. J. E. Hilgard, Washington, D. C.
Prof. J. C. Watson Ann Arbor, Mich.
Gen. Henry K. Oliver, Salem, Mass.
George F. Bristow, New York City.
Sir William Thomson, LL. D., D. C. L., F. R. S., Great Britain.
Jul. Schiedmayer, Germany.
E. Levasseur, France.
P. F. Kupka, Austria.
Edward Favre Perret, Switzerland.

XXVI.—*Architecture and Engineering.*

James B. Eads, C. E., New Orleans, La.
Gen. Wm. B. Franklin, Hartford, Conn.
Richard M. Hunt, New York City.
Sir John Hawkshaw, C.E., F.R.S., Great Britain.
M. Lavenne, France.
J. M. da Silva Continho, Brazil.
T. G. W. Fynje, Netherlands.

XXVII.—*Plastic and Graphic Art.*

Frank Hill Smith, Boston, Mass.
J. Taylor Johnston, New York City.
James L. Claghorn, Philadelphia, Pa.
Prof. J. F. Weir. New Haven, Conn.
Brantz Mayer, Baltimore, Md.
Donald G. Mitchell, New Haven, Conn.
George Ward Nichols, Cincinnati, Ohio.
Prof. Henry Draper, New York City.
Charles West Cope, R. A., Great Britain.
Peter Graham, Great Britain.
Carl Schlesinger, Germany.
Dr. H. Vogel, Germany.
Emile T. Saintain, France.
Fritz L. Dardel, Sweden.
P. N. Arbo, Norway.
Don N. L. Valdemoro, Spain.
Guiseppe Dassé, Italy.
Guglielmo de Sanctis, Italy.
Carl Costenoble, Austria.
Professor V. Dahlerup, Denmark.
J. E. Von H. von Beest, Netherlands.

XXVIII.—*Education and Science.*

Hon. A. D. White, LL. D., Ithaca, N. Y.
D C. Gilman, LL. D., Baltimore, Md.
Hon. J. M. Gregory, LL. D., Champaign, Ill.
Prof. J. W. Hoyt, LL. D., Madison, Wis.
Sir Charles Reed, Great Britain.
René Fouret, France.
Col. John Marin, Spain.
Prof. Theo Cleve, Sweden.

NOTES.

MICHIGAN.—(From the *Marquette Mining Journal.*) The *Champion Iron Mine*, is in the south half of Section 31, Town 48, Range 29. The mine was opened in 1867 on a deposit of magnetic and slate ore of remarkable extent and uniform purity. The shipments have been as follows:

	Gross tons.		Gross tons.		Gross tons.
1868	6,255	1871	67,588	1874	46,769
1869	19,458	1872	68,405	1875	57,979
1870	73,161	1873	72,782	Total	412,397

The mining system is similar to that adopted at the Michigamme; winzes are sunk on either side of each shaft, leaving pillars to protect the shafts and support the walls. The winzes and shafts are then connected by a drift, and the ore mined from underhand stopes of 60 feet. There is, consequently, no drifting except the few feet necessary to connect the shafts and winzes. Explorations have brought to light a vein or deposit of very pure red specular ore, wholly unlike anything found in the other deposits. This deposit, which was only four feet on the surface, widened out to thirteen and a half feet in going down twelve feet, and it is believed will prove a very material addition to the hitherto known value of the mine.

The mine affords employment to about two hundred men, mostly practical miners. The ore is all hoisted in skips operated by drums, the engine and machinery being of sufficient capacity to raise 1,000 tons per day from the lowest level.

Cleveland Silver Mine.—Iron River reports of the most encouraging character are received from this mine. The vein where cut by the downright shaft is found to carry a width of forty inches, and the ore is much richer, apparently, than any ever before mined in the district. The shaft strikes the vein at a depth of 300 feet, on the dip, and the miners are now drifting and taking out the ore. The size of the vein at the outcrop was only ten inches, and the fact that it is four times as large at the bottom of the shaft, is a most encouraging feature.

MINONG COPPER MINE.—The *Northwestern Mining Journal*, of the 17th ult., says with regard to this mine: "Operations so far have been confined chiefly to open cuts, with the exception of one shaft which was sunk, on the course of the belt, to a depth of 22 feet, through very rich ground, the copper taken out fully paying the cost of sinking. The workings cover about an acre of ground and are operated as a quarry. A considerable quantity of rich stamp work has already been piled up, although no attention has as yet been given to that as a source of product. About 30 tons of small mass and barrel work is ready for shipment and as much more can be produced in 30 days. Owing to the workings being all on the surface, the weather has seriously interfered with the development of the property during the winter months, and shaft sinking had to be abandoned because of the lack of any facilities for keeping out the water which was as plentiful as it was unexpected. The deposit which forms the Minong belt is as yet without a name—although literally it is a conglomerate as it carries all the known rocks of the trap range thoroughly mixed. On the course of the belt, the limits of which are not yet known, the surface is indented with ancient pits which are so numerous and close together as to warrant the belief that it was one of the most favored resorts of those indefatigable miners and successful copper locaters, the Aztecs—or whatever you may choose to call them. A substantial railroad has been built from the dock to the mine a distance of 5,300 feet, the entire cost of which (without cost of iron) was but $1,030. This road is used for carrying supplies to the mine and copper to the dock, and will be of ample capacity to run rock to a stamp-mill site, near which is an inexhaustible water-power of sufficient strength to run a hundred stamp heads.

The average cost for stoping will not exceed $7.50 per fathom. The entire mine cost up to May 1st, was $42,115.39 deducting from which $25,000 for copper produced, and $8,000 as available assets, makes a creditable showing. It is the intention to introduce power rock drills which are well adapted for the kind of mining pursued on this property. It has not yet been decided whether a stamp mill will be built this season, but the probabilities are that such will be the case, as sufficient productive ground is in sight to supply a small mill for a short generation, even supposing that mining should not be carried on below the present level.

NATURAL GAS SUPPLY AT PITTSBURG, PA.—We notice that Messrs. SPANG, CHALFANT & Co. have found that the obstruction in their gas pipe was caused by three plugs which were maliciously inserted in the pipe when it was being laid. We congratulate Messrs. SPANG, CHALFANT & Co. on having succeeded in finding the cause of the failure of their pipe, and hope that they will be rewarded, as they deserve to be, for having first introduced natural gas into Pittsburg. Now, that the pipe is clear, would be a favorable opportunity to make a series of carefully conducted experiments to determine with exactness the laws which govern the transmission of natural gas through long pipes.

COPPER DISCOVERIES IN WASHINGTON TERRITORY.—Copper has recently been discovered on Guemes Island, near San Juan, and promises to prove valuable, although very little work has been done as yet. At twenty feet from the surface it is stated that ore which assays 25 per cent. of copper has been struck.

GOLD IN INDIA.—Reports from Madras say that the Ooregaum gold fields are likely to prove successful in yield, 4 to 6 ozs. of the purest gold having been obtained from 1 ton of quartz, the working expenses being only ¾ oz. per ton.

GEOMETRICAL CHEMISTRY.*

By Henry Wurtz.

(*Concluded from page 512.*)

WE continue our extracts from Prof. WURTZ's papers as follows:

$CaCO^3$ *Calcite and Aragonite.*

Maximum of calcite—BEUDANT ..... 2·7234
Minimum of aragonite—RIEGEL ..... 2·92
Maximum of aragonite—BEUDANT ..... 2·947
" " " G. ROSE ..... 2·95

Calcite ..... $O^6\ {}^{2}_{20}C\left({}^{Ca}_{23}\ {}^{Ca}_{24}\right)$ = 2·7365

The calcium-molecule here is that in fluor-spar.

Aragonites ..... $O^6\ {}^{2}_{20}C\ {}^{2}_{22}Ca$ = 2·924.
$O^6\ {}^{2}_{20}C\left({}^{Ca}_{21}\ {}^{Ca}_{22}\right)$ = 2·985 (normal)

Calcium.—Of the metal *three* allotropes may be sharply and beautifully identified.

1. LIÉS-BODART & JOBIN ..... 1·55
$Ca_{29}\ Ca_{30}$ = 1·556
2. MATTHIESSEN ..... 1·584
Another sample ..... 1·584
$2\ Ca_{29}\ Ca_{30}$ = 1·584
3. CARON ..... 1·6
$3\ Ca_{29}\ Ca_{30}$ = 1·598

The beauty and simplicity of this series are apparent at a glance.

MgO. Ebelmen—artificial *crystalized* ..... 3·636
$O\ Mg_{18}$ = 3·631

The great condensation of Mg here, from its elemental volume of 13824 down to 5832, a new fact here for the first time developed, is of great interest. This condensation occurs during the combustion of the metal in the Bunsen Light; but we must not thence hastily attribute the phenomenon of that light to this great metallic condensation especially. For, in the combustion of *zinc*, which is only second in brilliancy to that of magnesium, I find that no condensation of the metal occurs; also with reference to phosphorus the same may be asserted.

Copper. This metal forms a beautiful series of *five* allotropes.

1. $2^{Cu}_{20}\ Cu_{19}$ = 8·334 } hard rolled.
2. $Cu_{20}\ Cu_{19}$ = 8·547 }
3. $Cu_{20}\ 2^{Cu}_{19}$ = 8·772 drawn copper (*wire*).
4. $Cu_{20}\ 3^{Cu}_{19}$ = 8·888 native, and some electrolytic copper.
5. $Cu_{20}\ 4^{Cu}_{19}$ = 8·959 precipitated, and some electrolytic; also cast (when chemically pure).

Cu^2O. Haidinger, native crystals ..... 5·992
$O\ 2^{Cu}_{21}$ = 6·032

CuO. Three allotropes.

PLAYFAIR & JOULE ..... 5·9
JOY, *melaconite* ..... 5·952
$O\ {}^{Cu}_{20}$ = 6·042

WHITNEY, *melaconite* ..... 6·25
$O^2\left({}^{Cu}_{19}\ {}^{Cu}_{20}\right)$ = 6·303

KARSTEN ..... 6·4304
JENZSCH, artif. crystals ..... 6·451
$O^4\left(3\ {}^{Cu}_{19}\ {}^{Cu}_{20}\right)$ = 6·45

In the last two kinds of CuO we have the elemental copper-molecules above Nos. 2 and 4.

Silver.

Silver in fusion.

PLAYFAIR & JOULE ..... 9·281
$Ag^9_{22}\ Ag_{23}$ = 9·262

Solid Silver furnishes a fine example of a series of *five* allotropes; of which No. 3 is the *dominant* one, and is supported by six or eight density figures.

1. $Ag_{21}\ 4\ Ag_{22}$ = 10·414 : KARSTEN ..... 10.4282 *et al.*
2. $Ag_{21}\ 3\ Ag_{22}$ = 10·484 : KARMARSCH ..... 10·482 *et al.*
3. $Ag_{21}\ 2\ Ag_{22}$ = 10·603 : G. ROSE, *Precipitated* Ag ... 10·5532 *et al.*
4. $Ag_{21}\ Ag_{22}$ = 10·849 : FORBES—Native Crystals .. 10·77
5. $2^{Ag}_{21}\ Ag_{22}$ = 11·108 : DANA—Native ..... 11·1

[The author now proceeds to state his further *generalizations* from the vast mass of diametric or geometric relations that he has computed and tabulated.] He continues:

I have arrived at what I believe to be overwhelming proofs of the following propositions, which I would here promulgate, in a somewhat imperfect and preliminary way, as Postulates of a Theory of Molecular Chemistry, to be perfected in future Memoirs:

1. Change of Volume, or of Density, in a specific liquid, or a specifically *homogeneous* solid body, whether compound or elementary—even when occurring without change of crystalline system—is an infallible indication of change of molecular structure, and consequently of chemical nature.

2. Conversely: when change of molecular structure, and therefore of chemi-

*Abstract of a paper read before the American Institute of Mining Engineers, at the Washington Meeting, February, 1876. The full text of the paper will found in the March number (just issued) of the *American Chemist.*

cal nature, occurs, change of volume and density probably always ensues; but this cannot yet be stated as broadly and absolutely as the former principle.

3. Such changes of volume—both in elements and compounds—are accompanied by changes in the *thermic* relations of the body, both internal or permanent and essential, and external or transient; and, conversely, such thermic changes are infallible indexes to definite transformations of molecular or chemical nature, whether these thermic changes are due to chemical or mechanical agencies, that is, to *molecular* or *molar* forces.

4. From 3, it will follow that the rise of temperature developed by *hammering a metal* or *crushing a rock*, thus forcibly changing its volume, or that of some of its constituent molecules (and under this I would also include the *heat of friction*), is due—partly at least, it may be almost wholly—to such changes of volume; such heat being of *internal* origin, or a conversion of *intra-molecular* or *atomic potential energy* into *energy of temperature*.

This latter form of energy, called popularly *Heat*, I am forced to regard as dynamic energy (or motion) of the *molecule*, as distinguished from latent (or potential) internal atomic energy. This *internal atomic* energy—which I wish here to define merely in a preliminary way—I would submit to be the cause of the occupation of the *space of the molecule itself* (the *inter-molecular* distances being due to molecular energy, or *temperature*, and therefore *possibly equal in all bodies at the standard temperature of Ice-fusion*). My molecular diameters become, then, the measures of *intra-molecular*, atomic, or chemical energies, and will be our guides to the laws that govern these.

We may reasonably conceive these diameters to define the *maximum* amplitudes of the atomic excursions inside the bounds of the molecule.

Having gone so far, I would here add further, that these views, deduced from the new geometric relations, enable us now, for the first time, to reconcile with the atomic hypothesis, and reduce to a clear conception, the speculation of KANT regarding chemical combination, as consisting in *Interpenetration of matter*, and not mere *Juxtaposition of atoms;* which latter was shown twenty-two years ago by STERRY HUNT to be the necessary conclusion from the interpretation of atomic views held by the most popular chemical teachers of the present generation. The proposition of HEGEL also, that chemical transformations involve, as he quaintly expresses it, "identification of the different and differentiation of the identical," becomes, in a sense, philosophical and intelligible. These hypotheses of KANT and HEGEL have been looked upon by STALLO, STERRY HUNT, and others, as embodying, or rather foreshadowing, the true chemical principle, whose development was awaited.

We might now at length define "chemical affinity," as Attraction of Molecular *Interpenetration*, forming new species of matter, as distinguished from Attraction of Molecular *Cohesion*, which merely holds molecules in solid and liquid forms; as well as from the *molar* Attraction of *Gravitation*. It is simpler, however, and may yet be found adequate, to assume only *one* universally inherent, attractive or centripetal force, with which chemical atoms (or say chemical "centers of force") are essentially endowed in different degrees (the "atomic weights"); all *repulsion*, *expansion*, and *contraction*, and all chemical, and other phenomena, being due to variations in quantity, kind, and direction of motion of the atoms, both individually (within molecules) and collectively (as molecules, within crystals, and other molar structures). We must admit, also, the modifying *influences* of the multitudinous species of *Vitalities*, which are not to be regarded as moving forces, but only as influencing or directing molecular motion, in ways that *may* never be wholly scrutable to us.

Changes from *solidity* to *liquidity* and the converse, which involve but small volumic change, are nevertheless generally both molecular and atomic—molecular usually in a *quantitative* sense, as involving temperature of the external medium, and atomic chiefly in a *qualitative* or *directional* sense, involving and implying, in solids, the polarization of the highly elliptical atomic orbits into certain planes, related, in ways hereafter to be sought out, to the crystalline axes or structure. I cannot here go so far as to touch upon the question of the *amorphous* or *colloidal* state.

I wish to point out, also, a modification of the generally received views of material structure, to which we are directly led. The *Intermolecular Spaces*, in solids and liquids, instead of being, as we have been taught, very large, compared with the (so to speak) *solid* molecular space, may, indeed *must*, be quite small. For the *great*, that is the *chemical*, condensations and expansions, are those arising from variations in amplitude of the internal atomic motions which define the molecule itself; while those due to variations of temperature (molecular motion) are comparatively very small. Regarding chemical molecules, provisionally, as *spheres*, it appears therefore that *intermolecular* space consists mainly of the necessary interstices between a collocation of spheres which, in effect, are *nearly in contact with each other*. Of course in *gases* we have enormously different conditions, at least as regards intermolecular spaces.

5. When an element (or radical) is isolated homogeneously throughout its mass, and within definite limits of temperature, and with an identity of other chemical and physical conditions, it will assume a definite molecular structure.

6. When a mass of an element which is molecularly homogeneous is subjected, uniformly throughout, to such forces—either *thermic*, *electric*, *magnetic*, *or mechanical*—as will permanently alter its density, the molecules shrink or expand at once to other definite modes of structure *throughout*—our new diametric numbers furnishing the definite measures of such changes.

[This, like the law of definite proportions in chemical combination, the wave-lengths in light, and other similar established principles of nature, is in direct conflict with the imaginary generalization embodied in that much-lauded aphorism of LINNÆUS: *Natura non facit saltum;* which seems, indeed, likely to turn out one of those numerous popular fallacies, that so mischievously and persistently obstruct Science.]

7. Indefinite mixtures of definite molecules may, of course, result, and the facts seem to indicate their (*exceptional*) existence; but they are, no doubt, due to lack of uniformity throughout the mass undergoing change, of some influential condition that yet remains to be ascertained.

[In the extended discussion under the head *Preliminary Suggestions regarding Chemical Classification*, of high interest to chemists, are involved new explanations of the nature and relations of elements and compounds, of hydrogen, oxygen, and water; of the nature of the decomposition of water by metals; and of the phenomena of electrolysis. We are obliged, however, to refer to the *American Chemist* for this also.]

Engymmetry and *Cratesis*. Before proceeding to the substantial reasons I have to present why the anomalous and exceptional nature of oxygen should not surprise us, the way must first be prepared, by the exposition of *two more new and great Laws;* which follow as generalizations from all my work, and which have been repeatedly hinted at already. These laws refer to the tendency of molecules to assume *proximate* diameters, which must have been obvious to every reader of this Memoir. This *proximation* is not so prevalent in binary and other simpler combinations, as it is in more complex bodies. It appears as if many binary, and often even ternary compounds possess, so to speak, *skeleton molecules*, which, as they fill up, *by progression in a series*, take the additional molecules, either elemental or elementoid, always *in intermediate diameters*, until, if the serial progression can be carried far enough, we arrive at length at a congeries of molecules having proximate or consecutive diameters. This tendency to proximation in diameters, I propose to state as follows:

SECOND LAW.

The Geometric Law of Molecular Engymmetry. A molecule added to a congeries tends to assume a diameter already present, or a diameter next below or above one, or between two, already present: in such manner that the tendency is more and more towards the formation of a succession of proximate or consecutive diameters, becoming more regular as the compound molecule becomes more complex.

Such an engymmetrical group or congeries of elemental or radical molecules, when regular and complete, or nearly so, I propose to call *a Plesymmetrical Molecule*, or more simply, a Plesymmeter.

To proceed now a step further:—I find that in the effort to reach this plesymmetric condition, another general law is invariably obeyed. This is that an electro-negative molecule never changes its diameter to conform to one less electro-negative than itself; or, to put it into more precise language:

THIRD LAW.

The Geometric Law of Molecular Cratesis. The tendency of an elemental or elementoid molecule to vary, according to the diametric ratios, in combining with other elemental or elementoid molecules, is in proportion to its degree of basicity, or electro-positive attitude, relative to the other elemental or elementoid molecules present.

Application to the Oxygen-Molecule.—It is in accordance with the law of cratesis, that oxygen, the most acidic and electro-negative of the elements, is destitute of tendency to change its volume.

The law appears to imply a coercive (*cratelic*) influence or power exerted by the negative over the positive elements or radicals, either to shorten or lengthen their molecular diameters; and there is a probability that we may yet be led to state the principle more explicitly thus:—the *Cratetic Force* is one which is *not reciprocal*, but is absolute in its action upon the more electro-positive molecule, *without reaction* upon the electro-negative one. This view, if found justified by further examination, might make it less difficult to understand why the pre-eminently electro-negative oxygen should be independent of the geometric law.

The oxygen-volume is not without very remarkable relations, nevertheless, to the series of even cubes, though these are not of a diametric or geometric nature. Thus, for example, the oxygen-volume is just *thrice the cube of* 12, a fact the significance of which (if it has any) I have yet to discern satisfactorily.

* * * * * * * *

I have discovered a relation between the fixed oxygen-volume and the variable hydrogen-volume, when the latter is in what is probably its *extreme state of condensation*. The smallest possible volume of hydor is $(18)^3=5832$, in which H can occupy but

$$\frac{5832-5184}{2}=324$$

which we may conceive to be the smallest or densest volume of which hydrogen is susceptible. Whether this be so or not, hydrogen in this volume has a most extraordinary relation to oxygen, as may be at once seen, on computing, side by side, the *densities* of oxygen, and of hydrogen in this smallest volume. This is done, of course, by simply dividing the equivalent weight in each case by the volume: The density of liquid (and solid) Oxygen$=\frac{160}{5184}=3{\cdot}08641975+$.

The density, in its smallest volume, of Hydrogen$=\frac{1{\cdot}00}{\cdot 324}=3{\cdot}08641975+$. The wonderful fact thus comes out, that in this smallest possible molecule of hydor, oxygen and hydrogen have *mathematically the same density*. In other words, the equivalent volumes of O and H in this hydor-molecule are directly as their equivalent weight; or, in the language of the Daltonian hypothesis, *as the weights of their atoms*. That is, the atoms here *occupy equal spaces*, just as they do when these two elements are *in the gaseous forms*. * * *

I believe I may venture to see in this remarkable deduction from the Law of Condensation, not only a demonstration of the truth and exactitude of our oxygen-volume 5184., and a confirmation of the whole of our new system of Geometric Chemistry, but also another *gate ajar*, permitting us a glimpse into much deeper and more beautiful mysteries than those I have endeavored already to set forth. These must await, however, a future time.

In concluding this Introductory Essay, I would again repeat—varying the phraseology only—the statement with which I began, that I claim to have discovered and demonstrated the same grand geometric laws which KEPLER traced as ruling the planetary system, as prevailing also in the microcosms we call molecules. And I must add that though many advanced chemists have long expected some great revelation from this source, yet now that a revelation has come, there are few, even among the boldest and most original thinkers, who will not be startled at the sweeping, in some respects revolutionary, tendency of these developments, with regard to the current theories of the schools and the school-books.

We must, nevertheless, accept the testimony of Nature's Facts and Figures, which she never alters to fit our most ingenious and cherished hypotheses, made in advance of our final appeal to her own safer and sounder teachings.

No. 12 HUDSON TERRACE, HOBOKEN, N. J., January 1, 1876.

PRODUCTION OF IRON AND STEEL IN THE UNITED STATES IN 1875.

Products in Net Tons.	1872.	1873.	1874.	1875.
Pig iron	2,854,558	2,868,278	2,689,413	2,266,581
All rolled iron including nails	1,941,992	1,966,445	1,839,560	1,890,379
All rolled iron, including nails and excluding rails	941,932	1,076,368	1 110,147	1,097,867
Rails of all kinds	1,000,000	890,077	729,413	792,512
Bessemer steel rails	94,070	129,015	144,944	290,863
Iron and all other rails	905,930	761,062	584,469	501,649
Street rails	15,000	9,430	6,739	16,340
Kegs of cut nails and spikes	4,065,322	4,024,704	4,912,180	4,726,881
Crucible cast steel	29,260	34 786	36,328	39,401
Open-hearth steel	3,000	3,500	7,000	9 050
All other steel	7.740	13,714	6,353	12,607
Blooms from ore and pig iron	58,000	62,564	61,670	49,243

From the *Bulletin of the Iron and Steel Association*, May 31st.

THE VERONA TOOL WORKS, PITTSBURG, PA.

WHEN we desire to purchase anything, we invariably go to those who advertise. First, because the fact of their advertising is presumption that they mean to do business, and those who "mean business" are those we want to deal with. Moreover, we have always found that the manufacturer who has the energy and life which shows itself in advertising, is sure to have a good thing to advertise; therefore, on general principles, we patronize him.

We wish to call attention to the special case of the Verona Tool Works, Messrs. METCALF, PAUL & Co., whose card will be found on another page. This is a live and pushing concern, which offers "Tools that are guaranteed to be the best," *and it means business.*

We need only refer those who need railway or mining tools to Messrs. METCALF, PAUL & Co., and we do the buyer no less than the seller a service.

FOURTH CONVERSAZIONE OF THE INSTITUTE OF MINING ENGINEERS.

THE most largely attended of these pleasant meetings at the rooms of the American Institute of Mining Engineers (1,123 Girard St., Philadelphia), took place on the evening of May 25, when more than 80 persons were present. There has probably never been before so large a gathering of American and foreign engineers, metallurgists, and geologists in this country. It included members of the Board of Centennial Judges, Foreign Special Commissioners, and men who in this country have distinguished themselves in practical science.

The enumeration of the names of them would crowd too heavily on the columns of the JOURNAL, and so we forbear from mentioning them. Mr. R. W. RAYMOND as Chairman, called on Dr. H. WEDDING, German Commissioner of Metallurgy, to address the meeting. Dr. WEDDING said that when his government was called upon to send a display to our Exhibition, it concluded to do so not from reasons of interest, as our protective tariffs were of such a nature that the products of Germany were practically debarred from being brought here; but for the purpose of showing our people what the best works in Germany could make. With this purpose in view, it had sent a comparatively small but, he thought, valuable collection of exhibits from the most important works of the country.

In illustration of this he mentioned the Krupp exhibit of steel, from the Essen district; the spiegel-irons and ore, from the Siegen district, and the plates and bar irons, from Upper Silesia. Mr. RAYMOND, in thanking Dr. WEDDING on behalf of the committee, said that Dr. WEDDING had forgotten to mention what seemed to him to be the most important exhibit of all which the German Government had sent over, and this was the commission of distinguished gentlemen of which the Doctor is a member, and who expect to report on the industrial condition of the country.

The Rooms of the Mining Engineers will shortly be changed to 1,100 Girard Street, nearly opposite where they are at present located.

NOTES.

A NEW USE FOR FURNACE SLAG and vitrious lava has been found by a Marseilles firm, it is the sophistication of sugar.

WASHINGTON COUNTY, MISSOURI, ZINC MINES.—Two hundred tons of zinc was the product of this County for the month of April.

COAL CONSUMPTION OF VENICE.—The total annual consumption of coal at Venice is about 5,000 tons, two-thirds of which is imported from England.

THE SHIPMENTS OF COAL AND COKE from the several pools of the Monongahela slackwater during April, 1876, were as follows: Pool No. 1, 1,464,500 bushels; No. 2, 4,883,000; No. 3, 1,757,600; No. 4, 2,204,800. Total, 10,309,900 bushels.

BELGIAN COAL MINING.—The total number of workmen employed in coal-mining industry in Belgium in 1874 was computed at 109,631. The average wages of each man were 3/4d. per day. The total production of 1874 was 14,669,000 tons, of the aggregate estimated value of £9,636,400.

THE SIERRA NEVADA COAL COMPANY (*Carson Appeal*).—This mine is situated near Verdi, in Humboldt County, Nevada, and promises to be one of the richest coal fields on the Pacific coast. The vein has been traced through the basin for two miles, and shows a breast of seven feet of brown lignite as well defined as any coal vein anywhere. 960 acres of coal land have been secured by the company. With the Sierra Nevada coal mine on the west, and the Humboldt Coal Company on the east—both contiguous, and both at work, there is a prospect of the Nevada coal trade assuming noticeable proportions this year.

THE LAKE SUPERIOR IRON ORE TRADE.—The *Iron Home*, of the 27th instant, gives the following as the shipments of iron ore from the port of Escanaba, for the season of 1876, up to the 24th of May:

	Tons.		Tons.
Jackson	8,019	Michigamme	963
New York	5,514	Winthrop	991
Cleveland	750	South Side Jackson	1,200
Angeline	2,805	McComber	307
Barnum	4,163	Bessemer	687
Saginaw	7,001		
Superior	923	Total gross tons	34,989
Rolling Mill	1,660		

THE Barnum, New York, and Cleveland Mining Companies have all commenced shipping ore on a large scale. The New York Company has a larger stock pile this Spring than ever before, and the same is the case with the Barnum. The Lake Superior Mining Companies have not mined very much this last Winter, and it is thought have not sold any more ore than is now on the surface at the different stock piles. As these are the four principal mines in our immediate vicinity, we do not deem it necessary to mention the smaller ones in their connection.

THE Marquette *Mining Journal*, of the 27th inst., says: "The Republic Iron Company are shipping about one hundred and twenty-five cars of ore per day. They have about thirty-five thousand tons in stock pile, and will probably ship not less than one hundred thousand tons the coming season. Although they have not as much in stock as they had last year at this time, the mine is in much better shape and condition for rapid mining, and were it necessary a larger amount could be shipped this season than could have been last."

THE *Inter Ocean*, of May 27th says: "All the larger vessels running here are carrying on old contracts at $3 per ton. They have three or four more trips to make, after which they will have to come down to $1.50 or $1.40, or perhaps less. Freights from Escanaba to Cleveland average $1.25. There have been but few charters made, and those were for $1.50 from here to Cleveland and Erie, and $1.25 Escanaba to same ports. Taking into consideration the fact that the larger carriers in the ore trade will soon clean up their contracts (which will not take them quite half the season), there must, if they continue in the trade, be a large amount of tonnage for charter, which will tend to keep freights where they are now, if they do not meet with a still greater reduction, without there is a decided change for the better, both in the demand and price of ore."

THE EBERHARDT AND SOUTH AURORA SILVER MINE.—The *White Pine News* under date of the 20th inst., says with regard to this mine: "That the Company has decided to run a tunnel through Treasure Hill, and that workmen are now engaged in making the open cut, preparatory to the arrival of the Burleigh drill and other necessary machinery. The tunnel is started on the south side of Treasure Hill, in Mahogany Cañon, and in its course will cut some of the most valuable mining properties in the Hill, including that of the South Aurora Company, who, it is reported, have an interest in the new tunnel project. The distance to be run through the hill is about 5,000 feet, and will require two years to complete, the estimated cost is $150,000. It will strike the ores at greater depth and facilitate getting rock to the mills during all seasons of the year, and also save three dollars per ton in hauling. The construction of the tunnel will not in any manner interfere with the ordinary operations of the mine. The upper workings have in sight and stripped, not less than 3,000 tons of ore, and, judging by the tons and tons that have been worked from the same locality, will average sixty-six dollars to the ton. This tunnel, and the one now being run by Major Henry, will fully demonstrate whether the mines in Treasure Hill have depth, like those of the Comstock, and the best informed mining men and experts have no doubts on this point." The profits of this mine for the last half of 1875 amounted to nearly $200 000. The stock of the Company is all held in London and consists of 23,500 shares in £10 shares, fully paid. We note recent quotations of the stock at from £7 15/@£8 per share.

The San Jose Mining Company have completed their 1,200 feet of tunnel in Egan Cañon and struck the ledge they have for a long time been tunneling for, and have commenced drifting on the ledge The future prospects of this Company are very flattering. Their mill is in successful operation, and is kept constantly employed in working the company's ores and some from Cherry Creek.

The *Foothill Weekly Tidings*, of the 20th ult., says:—"*The Gold Run Mine*, near Nevada City, is now in condition to turn out bullion. A shaft 260 feet deep, with drifts 625 feet north and 40 feet south and many drifts on other levels, give room for the present force to raise 20 tons of ore per day, which it is said will pay an average of $20 per ton. The hoisting machinery is capable of draining and working the mine 500 feet below the present levels. The mill, which was erected this Spring, consists of a Wilson's Steam Battery, capable of reducing about 16 tons per day. The gold is caught in sluices covered with electro-plates, and the sulphurets in a concentrator below.

The Vernon Mining District is located about ninety miles south-east from San Bernardino, and ten miles south of the boundary line between San Bernardino and San Diego Counties. It is twenty-five miles from Indian Wells, the present terminus of the railroad, with a splendid wagon road to the mines. The principal mines are named the Washington, Whatunma and Saranac. The ledge of the latter crops out a distance of about a mile and a-half, and averages from two to six feet in width; the croppings assay from $50 to $1,000 in gold per ton.

The Lucky Queen Mine in Douglas County, Oregon. This mine gives returns of $28 gold per ton on an average, and two assays of rock taken from different places in the tunnel of the mine gave $1,276 and $105 per ton respectively. The ledge is about six feet in width, and anywhere in the tunnel gold is visible.

CALIFORNIA HYDRAULIC GOLD MINES.—The Dutch Flat *Forum* says, that all of the following claims are situated in Nevada County:

The Empire Claim, located in and adjoining the Little York Mining Company, an English corporation, contains 250 acres of ground, with an average gravel bed of about 70 feet, through which the blue lead channel runs, which is the richest part of the claim. The claim is worked through a bedrock tunnel 1,440 feet long, which empties into Steep hollow. They use 1,400 inches of water with 235 feet pressure, the water being taken from their own ditch through a pipe 1,000 feet long, which is four and a-half feet at the sand tank, tapering down to 22 inches, and run through two giants with six inch nozzles. Twenty-five white men are employed on this claim (the superintendent does not think it economy to have Chinamen), who are kept constantly employed. This claim has been running since April 1st, and will continue until June 1st, before they clean up. An instrument called a deflector is used on the mouth of the nozzle in the claim, which, it is thought, will prove to be a great labor-saving invention. It is arranged in such a manner that the water from the nozzle moves the giant, and the lever that moves the deflector can be handled by a ten-year old boy.

The Christmas Hill Claim comprises 145 acres of land, with an average gravel bed of 90 feet. Twenty men are kept at work here. Here they use 800 inches of water, through a pipe 9,000 feet long. They have made four clean-ups this season, every one of which paid a dividend.

The Council and *Liberty Hill Claim*, owned by the same companies, uses 1,400 inches of water, and runs the last claim with a full force of men. From past and present indications it is expected that this claim will prove to be the big bonanza of the Nevada County side of Bear River. Generally speaking, the claims so far this season are looking more encouraging than ever before, and the prospects for a good Summer's work are flattering.

PROPOSALS WANTED.—We take the following items from the *Engineering News* of Chicago; they may be of interest to some of our readers:

Roof and Cornice Work.—Proposals will be received at the office of the Washington Aqueduct in Washington, D. C., until 12 M., June 12, for constructing an iron truss roof and galvanized iron cornice on the Gate House at Great Falls. Plans and specifications and all necessary information can be obtained from O. E. BABCOCK, Colonel of Engineers, U. S. A., Chief Engineer, Washington Aqueduct.

Dredging.—Bids will be received at the City Engineer's office, Providence, R. I., until June 10, at 12 M., for removing 250,000 cubic yards (more or less) of earth from the Cove Basin. Bidders will state price per cubic yard for excavating and removing the earth to be at the disposal of the contractor. Further information may be obtained by addressing CHAS. E. PAINE, City Engineer, No. 17 Fourth Main Street. Proposals properly indorsed should be addressed to HENRY C. CLARK, Chairman of the Committee.

Bridge.—Proposals will be received at the Auditor's office, in Bryan, Ohio, until 12 o'clock M., June 7, for the superstruction of a Howe Truss, or Smith Patent Pine Bridge (high double truss), across the St. Joseph River at West Buffalo, 110 feet clear span, 120 feet extreme length, 16 feet roadway. Bids for superstructure of bridge to be per lineal foot, measuring the lower chord. Said bridge to be set on pile abutments, two rows of five piles each, at each end of the bridge; also, four 16-feet wings four piles to each wing. The timber for pile work to be young, thrifty white oak. Contractors to furnish their own plans and specifications for bridge. Plans and specifications for pile work can be seen at the Auditor's office in Bryan. By order of the Commissioners. J. KELLEY, County Auditor.

Steam-Heating Apparatus and Boiler.—Proposals will be received by the Regents of the University of Wisconsin for putting a steam apparatus to heat about 750,000 cubic feet, in their new Science Hall building. Also, separate proposals for furnishing a low pressure steam boiler of 8 feet diameter and 26 feet length. The plans and specifications for both classes of work can be seen in Milwaukee, at the office of H. C. KOCK, architect, where any information in relation thereto can be had. Proposals will be received by JOHN S. DEAN, Secretary, at Madison, Wis., before June 18; will be considered, and, if satisfactory to the Regents, the work will be contracted for. N. B. VAN SLYKE, Chairman Building Committee.

Pumping Engines.—The Board of Water Commissioners of the city of Springfield, Illinois, will receive proposals until 1 o'clock P. M., on the 7th day of June, for supplying a Worthington Duplex High Pressure Pumping Engine, with steam cylinders 21½ inches in diameter, plunger 17 inches diameter, 36-inch stroke, to deliver five million gallons of water in twenty-four hours. Also one small Duplex Boiler Feed Pump, steam cylinder 6 inches, with plunger of 3½ inches by 6-inch stroke. The above to be delivered and set up at the Springfield Water Works on the foundation to be prepared by the said Board thereat, complete and ready for use in the shortest possible time, or not exceeding ninety days. H. O. BOLES, C. A. HELMLE, GEO. WHITNEY, Commissioners.

STATISTICS OF COAL PRODUCTION.

This is the only Report published that gives full and accurate returns of the production of our Anthracite mines.

Comparative Statement for the week ending May 27.

Tons of 2,240 lb.	1876. Week.	1876. Year.*	1875. Week.	1875. Year.*
Wyoming Region.				
D. and H. Canal Co	31,299	776,475	75,421	1,191,958
D. L. and W. RR. Co	18,358	494,683	78,951	1,131,865
Penn. Coal Co	15,195	362,231	26,147	471,856
L. V. RR. Co	23,256	353,001	9 919	345,600
P. and N. Y. RR. Co	877	10,272	4,273	37,984
C. RR. of N. J	30,663	456,263	16,927	162,849
Penn. Canal	13,336	78,701	794	1,439
	132,984	2,531,686	212,432	3,343,542
Lehigh Region.				
L. V. RR. Co	58,586	778,523	10,321	159,697
C. RR. of N. J	33,478	416,741	23	5,628
D. H. and W. B. RR	542	13,851	1,149	18,627
	92,606	1,209,115	11,493	183,952
Schuylkill Region.				
P. and R. R. RR. Co	128,960	1,488,283	30,446	469 720
Shamokin & Lykens Val.	19,009	280,737	30,066	386,073
	147,969	1,769,020	60,512	855,793
Sullivan Region.				
Sul. and Erie RR. Co	6,201	23,740	—	5,419
Total	379 760	5,533,561	284,437	4,388,706
Increase	95,323	1,144,855	—	—
Decrease	—	—	—	—

* Year beginning January 1st.

The above table does not include the amount of coal consumed and sold at the mines, which is about seven per cent. of the whole production.

The receipts at Port Richmond for the week were 61,000 tons, shipments 48,500 tons, and balance on hand 188,500 tons.

The decrease of shipments of Cumberland Coal over the Cumberland Branch, and Cumberland and Piedmont Railroads amounts to 201,506 tons, as compared with the corresponding period in 1875.

Perth Amboy business:

	Tons.
Received for the week	17,350
Shipped for the week	19,539
On hand May 27	88,764

Freights to Boston, 1.00; Bridgeport, 60c.; Hartford, 95c.

Receipts of Coal at Boston, for week ending May 26, and years from September 1st, 1874 and 1875.

From	Week. Tons.	Previously. 1876. Tons.	1875. Tons.
Alexandria and Georgetown	830	62,600	56,721
Philadelphia	9,131	460,723	306,786
Baltimore	1,720	98,261	115,695
Other places	5,400	213,722	157,576
Great Britain	—	4,213	2,124
Nova Scotia	570	12,851	15 378

Belvidere Delaware RR. report.

	Week.	Year 1876.	Year 1875.
Receipts of coal at Coal Port (Trenton)	9,905	64,302	206
" " " South Amboy	6,305	178,236	19,801
Shipments at Coal Port (Trenton)	10,329	61,675	196
" South Amboy	6,500	157,589	97,813

Coal Shipped at Pictou, N. S., for week ending May 27. 1876 ..... 5,339 tons.
Previously exported ..... 13,465 "
Total to date 18,804

The Production of Bituminous Coal for the week ending May 27, was as follows:

Tons of 2,000 lb., except where otherwise designated.

Cumberland Region, Md.	Week, Tons.	Year, Tons.
Tons of 2,240 lb	46,654	565,781
Barclay Region, Pa.		
Barclay RR., tons of 2240 lb	4,562	134,237
Broad Top Region, Pa.		
Huntingdon and Broad Top RR	3,375	65,720
*East Broad Top	1,329	27,833
Clearfield Region, Pa.		
*Snow Shoe	1,078	21,111
*Tyrone and Clearfield	26,489	413,165
Allegheny Region, Pa.		
*Pennsylvania RR	3,870	78,993
Pittsburgh Region, Pa.		
*West Penn. RR	4,098	80,841
*Southwest Penn. RR	1,297	21,092
*Penn. & Westmoreland gas coal, Pa. RR.	15,610	264,819
*Pennsylvania RR	3,842	116,858

* For the week ending May 14.

The Production of Coke for the week ending May 14.

Tons of 2000 lb.	Week. Tons.	Year. Tons.
Tyrone and Clearfield	..	..
Alleghany Region	..	..
West Penn. RR	695	17,403
Southwest Penn. RR	10,827	175,936
Penn. & Westmoreland Region, Penn. RR.	1,396	14,887
Pittsburgh, Penn. RR	3,367	75,659
Total	16,285	283,885

COAL TRADE REVIEW.

NEW YORK, Friday Evening, June 2, 1876.

Anthracite.

The action of the Combination in resolving to curtail the production of coal during the months of June and July, has had thus far, no perceptible effect upon buyers. Some of the individual firms claim a slightly increased business, but the large companies see no improvement. The retail dealers have but a very small demand from their customers, and are buying but little; and, in the present unsettled condition of trade, manufacturers do not anticipate their wants.

If there be any who still look for a disorganization of the Combination during this year, they are likely to be disappointed. The strength of the union is guaranteed by the individual weakness of the companies. There is not one of them that can afford to see it break, and no matter how threatening the situation may appear, it is likely to end by submission on the part of the offenders.

The stocks of the coal-carrying companies have depreciated very materially since the opening of the year, as has also their standing in financial circles. In their efforts to make at the end of the first six months what may appear very satisfactory statements, the managers of the companies have thoroughly demoralized trade, while the stock-holders will be no better, nor even as well off, in the end.

The production of coal this year has been much greater than for the same period of 1875, but the amount of coal disposed of by the companies has not been nearly so great. The most demoralizing feature in the trade at present is the large stock of coal that has accumulated at various points. By curtailing production during June and July, it is hoped that this state of things will be alleviated; but it seems at present as if the quantity of coal to be sent to competitive points during this month—though the mines are to be worked only alternate weeks—is likely to be sufficient to supply all the requirements of the trade.

The fact that there is little demand, little use for coal is, of course, the self-evident immediate cause of the depression in the trade. But we seek for the more remote and ultimate causes, those that effect the demand in urging the necessity for cheaper coal as inducing a larger consumption, by enabling manufacturers in various industries to find a foreign outlet for their product, we do not for a moment suppose that a reduction of even a dollar a ton, to-day, would create at once a much greater demand, or immediately cause a revival of any business.

The whole case is summed up in the statement that our productive capacity, in many industries stimulated to an abnormal activity by various causes, has been increased beyond the consumptive requirements of the country even in ordinary "good times," and there can be no possible permanent revival in those industries till they can send their surplus out of the country. To enable them to do this they must secure a reduction in the cost of many items, one of which is coal.

We beg our enterprising contemporaries of the coal regions, the *Workingman*, the *Mahonoy Valley Record*, and the Hazleton *Sentinel*, who object to our deductions, to bear in mind that the demand for coal, and with it, for labor at the mines is dependent upon remote causes, and cannot be permanently increased till our iron, cotton, and some other manufacturers are able to do a considerable export business. Nothing is easier than to declaim against such views as advocating the reduction of wages to the starvation point, and degrading our laborers to what our protectionist friends have loved to call "the level of the pauper labor of England," but such assertions go for naught, while the facts remain that we must either "meet this market" or stand idle.

It is worse than useless to suppose that we can change these facts by simply finding fault with them, the wisest course is to recognize and adapt ourselves to the new state of things, and the sooner we do so the sooner will we bring about that longed for revival that will give employment to all, even if it be at lower wages. So far as the miners in the anthracite region are concerned, we can see no hope for better times, till a large number leave the coal fields and seek in our Western gold and silver mines and in agriculture a subsistance that there is little prospect of their obtaining wherethey now are. They are now earning but "starvation wages" when we take account of the frequent "suspensions" they have to submit to, and they can do better almost anywhere in the West than they are likely to do for some time to come in the East, judging from present indications.

Bituminous.

There has been no further important business reported in either Cumberland or Clearfield coals. From the orders already booked by the Clearfield companies they are likely to maintain their output, while the indications are that the Cumberland output will be reduced below even what it is at present. The decrease in business over the Cumberland railroads firm January 1, 1876, to May 27, as compared with the corresponding period of 1875, was over 201,000 tons, being a decrease last week of over 19,000 tons. The Baltimore & Ohio R.R., and the Chesapeake & Ohio Canal each lost, for the week, in their receipts of Cumberland Coal, as compared with the corresponding week of 1875, about 9,000 tons.

Coal Trade of Philadelphia.

PHILADELPHIA, June 1, 1876.

Circulars are out announcing "an absolute suspension of all production of coal in the Anthracite Region in each alternate week, during the months of June and July, commencing the 5th day of June," and also "an advance of 10 cents on all sizes for the month of July and a further advance of 15 cents on all sizes for the month of August for line and city trades." These two facts put together do not "hitch well," unless intended to show the power possessed by the Combination. Contrasting the tonnage, because of a tremendous overstock and putting up prices—which were already too high for the condition of the business of the country—are contradictions and the stimulant must fail after the evidence given that full work for half of the year would produce more than can be marketed. There is a contrast at Port Richmond of wharves that are bare and of others that are gorged, which speaks volumes for the bad reputation of the trade, and to many who have not had for a single day this year a fair supply of cars and are unable to fill their orders, taken in full conformity with the decrees of the Combination, it seems a crying injustice that because others cannot dispose of their coal, they should be prevented doing so. A curtailment in the production has been a necessity, for months past, but it ought to be equitably distributed, and should have been applied long before the present striking contract became possible.

Freights are naturally tending downwards when those who have orders to ship coal receive it very slowly for want of cars, and those who have plenty of coal on hand have no orders to ship. $1.25@$1.30 are full rates to Boston and Portland; $1.20@$1.15 to the Sound, and 50 cents to Norfolk, 65 cents to Richmond and 70 cents to Washington.

Wholesale Prices of Anthracite Coal for June, f.o.b. at the Tide Water Shipping Ports per ton of 2240 lb.

	Lump.	Steamer.	Grate.	Egg.	Stove.	Chestnut.
Wyoming Coals.						
‡Lackawanna and Scranton at Hoboken and Weehawken	4 70	4 80	4 90	5 00	5 60	4 90
Pittston at Newburg	4 55	4 65	4 75	4 85	5 45	4 75
Wilkesbarre at Port Johnston	4 70	4 80	4 90	5 00	5 60	4 80
Plymouth, R. A.	....	....	4 90	5 10	5 70	4 90
Susque. Coal Co. at Amboy W.A.	4 70	4 80	4 90	5 10	5 60	4 90
Kingston at Hoboken	4 70	4 80	4 90	5 10	5 60	4 90
Lehigh Coals.						
Old Company at Port Johnston	5 20	....	5 00	5 00	5 60	4 90
Old Company's Room Run "	5 20	....	5 00	5 00	5 60	4 90
Sugar Loaf, Hobok. & Amb. "	5 20	....	5 00	5 00	5 60	4 90
Lehigh Coal Exchange "	5 20	....	5 00	5 00	5 60	4 90
Honey Brook Lehigh	5 20	....	5 00	5 00	5 60	4 90
Beaver Meadow at South Amboy	5 20	....	5 00	5 00	5 60	4 90
Schuylkill Coals at North 9th st., Brooklyn, E. D.†						
Schuylkill white ash	4 70	4 80	4 90	5 00	5 60	4 80
Schuylkill red ash	..	....	....	5 10	5 70	4 80
Shamokin white and red ash	....	....	....	5 20	5 70	4 80
Lorberry	....	....	5 80	5 80	5 80	4 85
Lykens Valley	....	....	6 25	6 25	6 25	5 30

* Contractor's prices are 20c. per ton less.

†The prices of Schuylkill coals for shipment from Philadelphia are 35c. per ton less than at Brooklyn.

‡ Boats towed by the D. & H. C. Co. at its expense to and from New York harbor.

	Per ton.
Freight from Hoboken and Weehawken to New York	40c.
" " Elizabethport & Port Johnston to N. York.	40c.
" " South Amboy to New York	30@55c.

Freight by the boats of the companies from Hoboken, Port Johnston, Weehawken, Rondout, South Amboy and Perth Amboy to New York City and vicinity 50c

Freight by the Pennsylvania Coal Company's boats from Newburg to New York 65c.

Wholesale Prices of Bituminous Coal.

Domestic Gas Coals.

Per ton of 2240 lb.	At the Shipping Ports.	Alongside in New York.
Westmoreland and Penn. at Greenwich, Philadelphia	$4 70	$6 00
" " at S. Amboy	5 50	6 00
Red Bank Cannel Pa. at Philadelphia	8 00	8 50
" " South Amboy	8 50	....
" Orrel	6 00	6 50
Youghiogheny, Waverly Co., at Balt	4 25	5 75
Delpard, West Va.	4 50	6 00
Murphy Run, West Va., at Baltimore	4 50	6 00
Fairmount, West Va., " "	4 35	6 00
Newburgh Orrel, Md. " "	4 50	6 00
Cannelton Cannel, W. Va.	....	10 00
" Splint, " at Richmond	4 50	6 00
" Gas Coal at Richmond	4 00	....
" " " New York	5 50	....
Peytona Cannel, W. Va. at Richmond	8 50	10 00

Manufacturing and Steam Coals.

Cumberland, at Georgetown and Alexandria, Va	3 65@3 75 / 5 00
Cumberland, at Baltimore	3 90@4 00 / 5 25
Clearfield f.o.b. Canton, Baltimore	3 75@4 00

Rockhill Semi-Bituminous and Broad Top, at the mine, per 2,000 lb., 90, f. o. b. Greenwich, Philadelphia, per 2240 lb., $3 60@3 95, according to destination; at Amboy, 4 60; New York, 5 00.

Clearfield and Allegheny, "Kittanning," "Sterling," "Sonman," and "Eureka," at the mines, per 2000 lb., 90; at Greenwich, Phil., per 2240 lb., 3 75@4 25, according to destination; f.o.b. South Amboy, N. J., 4 75; New York, 5 25.

Foreign Gas Coals.

	Sterling.	Am. cur'cy.
Newcastle, at Newcastle-on-Tyne	9/6@11/	6 50@ 7 00
Liverpool House Orrel, at Liverpool	26/	13 00
Ince Hall Cannel "	42/	18 00
" Gas Cannel "	28/	13@14
Scotch Gas Cannel, at Glasgow, nominal,	25/	7 50

	Gold.	
Block House, at Cow Bay, N. S	2 00	5 00
Caledonia, at Port Caledonia	1 50	4 75
Glace Bay, at Glace Bay	1 50	4 75
Lingan, at Lingan Bay	1 75	....
Sydney, International and Reserve mines, at Sydney	2 00	5 50
Pictou, Albion & Vale mines, at Pictou.	2 25	5 75

Retail Prices in New York.

Anthracite.

Per 2000 lb.	Grate and Egg.	Stove. Chestnut.
Pittston coal, in yard	$5 70	$6 00 $5 30
Lackawanna coal, in yard	5 70	6 00 5 30
Wilkes-Barre, delivered	6 25	6 75 6 00
Lehigh & Locust Mountain, d'l'd	7 00	7 00 6 00
Schuylkill Red Ash, del'd	7 50	7 50 6 00

The Cost of delivery for Pittston and Lackawanna coal ranges from 40 cts. to $1 10 per ton, according to distance from the yard.

Bituminous.

Liverpool House Orrel, delivered, per ton of 2000 lb	$18 00
Liverpool House Cannel " " "	†22 00
American " " "	13 00
Cannelton splint, " " "	9 00
Cannelton Block, " " "	9 00
American Orrel " " "	11@14
Red Bank Cannel " " "	14 00
Cumberland " " "	7 00

† This quotation is furnished to us by Messrs. WARD, TALBOT & OLYPHANT.

Baltimore, Md. June 1, 1876.

Reported by our Special Correspondent.

ANTHRACITE.

Wholesale or Trade Prices per 2240 lb.

Wilkes-Barre "Lee" or "Diamond," Pittston and Plymouth. White ash.	In cars at depot.	By boats afloat.
Lump and steamboat	$4 62	$4 47
Broken	5 10	4 8,
Egg	5 20	4 95
Stove	5 51	5 36
Nut	4 66	4 51
Shamokin, (red or white ash), and "Boston," free burning white ash,		
Egg	5 20	5 00
Stove	5 50	5 25
Lykens Valley, red ash,		
Egg and stove	6 05	5 68

From wharf or yard, wholesale, 50@75c. additional.
By retail, all kinds and sizes, per 2240 lb. $5 25@7 75

BITUMINOUS.

George's Creek, Cumberland f. o. b. at Locust Point. 3 90@4 00
West Virginia Gas f. o. b. at Locust Point 4 50
Youghiogheny Gas, f. o. b. at Locust Point 4 50

Boston. May 27, 1876.

COAL is very dull for cargoes or from yard. This applies equally to anthracite, bituminous, and gas, not a ripple of business for the week. The receipt of three cargoes Nova Scotia coal on early gas-house orders is the only novelty for a fortnight. Freights are unchanged, nor is there anything at all apparently encouraging about the near future.—*Commercial Bulletin.*

Buffalo, N. Y. June 1, 1876

Reported by our Special Correspondent.

The Scranton, Wilkesbarre, Plymouth, Shamokin, and Delaware and Hudson (Lackawanna) coals are offered for the present, subject to printed conditions, at the following prices per ton of 2,000 lb :

Deliv'red at	Elmira.	Ithaca.	Syracuse	Rochester.		Oswego
	Afloat	Afloat.	Afloat.	afloat	ret. del.	f.o.b.
Grate	$4 05	$4 35	$4 50	$5 20	$6 45	$5 45
Egg	4 05	4 35	4 50	5 20	6 45	5 45
Stove	4 45	4 80	4 95	5 65	6 90	5 90
Nut	4 15	4 50	4 65	5 35	6 60	5 60

Delivered at	Erie.	Buffalo.		
	f.o.b.	Afloat.	f.o.b.	ret. del.
Grate	$5 95	$5 45	$5 95	$6 70
Egg	5 95	5 45	5 95	6 70
Stove	6 40	5 90	6 40	7 15
Nut	6 10	5 60	6 10	6 85

Cost of coal from Erie, Oswego, or Charlotte for Western market, same as if shipped from Buffalo. Terms cash. All payments to be made in New York City funds.
C. M. UNDERHILL, Gen. Salesman, Buffalo, N. Y.

Cincinnati, O. May 31, 1876.

Reported by our Special Correspondents.

Please continue to quote prices of coal as previously reported, there has been no change for some time, and nothing of interest occurring in the coal business, except the suspension of several of the coal dealers.

Per ton of 2000 lb.	Bush.	Ton.
Youghiogheny, or Pittsburgh, afloat	7½@8c.	—
Pomeroy coal "	5 @6c.	—
Kanawha " "	7 c.	—
Cannel coal, according to quality "	11 @16c.	—
The following are the retail prices delivered		
Youghiogheny	10c.	—
Pomeroy	9c.	—
Cannel	14@22c.	—
Kanawha Semi-Cannel	10c.	—
Anthracite, per ton	10 50@11 00	—
Coke, at yard	7c.	—
Coke, hard and soft, delivered	9@10c.	—

Chicago, Ill. May 31, 1876.

Specially reported by Messrs. RENO & LITTLE, Coal Merchants.
Retail prices per ton of 2000 lb. delivered to buyer.

Prices of Anthracite coal dropped $2 since last report. The prices of Bituminous coal are disturbed also, perhaps by next week prices of all coal will have settled to a fixed point, and then we can send you a corrected price list.

Louisville, Ky. May 30, 1876.

Specially reported by Messrs. BYRNE & SPEED.

Our market is now, as during most of the Winter, very quiet.

Please report our prices as follows :

WHOLESALE.

	per bushel		per bushel
Pittsburgh	12c.	Pine Hill	—
Raymond City	9c.	Kentucky	8c.

RETAIL.

	per bushel		per bushel
Pittsburgh	12c.	Peytona Cannel	20@22c.
Raymond City	11c.	Buckeye "	20c.
Pine Hill	13c.	City-made Coke	10c.
Kentucky	10c.	Anth., per ton, $10 00 to 10 50	

Screened Pittsburgh per load	$3 00
Screened Raymond City	2 75
Pine Hill (Kentucky)	2 75
Cannel	$5 to 5 50

Milwaukee, Wis. May 31, 1876.

Specially reported by Messrs. R. P. ELMORE & Co.
Retail price per ton of 2000 lb.

Lehigh Lump	$10 00	Briar Hill, select	$8 00
Lehigh Prepared	11 00	Blossburgh	8 00
Lackawanna (all sizes)	10 00	Cannel	8 00
Pittston	10 00	Pittsburgh	7 00
Scranton	10 00	Steam coal	6 00

San Francisco, Cal.

From the *Commercial Herald*, May 25, 1876.

Imports from Jan. 1st to May 16th :

	tons.		tons.
Anthracite	7,292	English	8,973
Australian	18,396	Vancouver Island	42,185
Coos Bay	15,984	Rocky Mountain	98
Cumberland	2,144	Seattle	12,523
Mt. Diablo	33,832	Bellingham Bay	10,820

We have now to announce the arrival of the British ship *Castle Roy* from Liverpool with 1,858 tons; bark *Van Dieman*, 1,500 tons, from Newcastle, N. S.W. These with regular coast supplies keep up stocks, and with large prospective arrivals we see no show for any rise in values, but quite the reverse, owing to large contract purchases of Liverpool steam, etc., for Summer and Autumn delivery. We note recent sales of cask Cumberland at $16.50, ex-ship. Lehigh and other anthracite is plentiful, and spot cargoes can be purchased at $12. We reduce quotations of Australian at $9.50@10 ex-ship. Cumberland in casks jobbing $18@20; Bellingham Bay $8.50; Coos Bay, $9.50; California Mt. Diablo Steam, $6.25@8.25 for fine and coarse respectively; English and Scotch steam, $9@9.50; Nanaimo, $9.50@10; Seattle, $9.50@10; Anthracite, $12; Lehigh, $12@14; Wellington, $11@11.50, latter screened. The British ship *Isle of Erin* from Newcastle, N. S. W., brings 1,362 tons, and the British ship *Corolla* 1,730 tons same.

Rates of Transportation on Anthracite Coal to Tide Ports.

Lehigh and Wyoming Coals, per ton of 2240 lb	From Penn Haven.	From Mauch Chunk.	From Hazleton**		From Upper Lehigh.		From Ashley and Sugar Notch.	
To ‡ Newark, N. J. (117 miles), via Central Railroad of New Jersey	2 32	2 18	2	74	2	63	2	86
‡ Mauch Chunk, Pa., via Central Railroad of N. J.	14	..	56		47		70	
‡ Philipsburg, N. J., (46 miles)	87	73	1	21	1	19	1	42
Elizabethp't, (114 m) Pt. Johns., Hoboken & South Amboy, N. J., shipping and wharfage 35c. add.	1 96	1 82	2	29	2	27	2	50
High Bridge, N. J.	2 40	1 95	2	80	2	54	2	72
Elizabeth, Cranford, Westfield & Elizabethport, for consumption,	2 32	2 18	2	65	2	65	2	88
Jersey City, N. J., (121 miles) and New York, via L. V. RR.	2 37	2 18	2	65	2	65	2	88
Andover, via Delaware, Lackawanna and Western RR.	3 30	3 10	3	70	3	69	3	99
Trenton Somerset Junction and Greensburg, via P. RR. Belvidere Division	2 65	2 45	3	05	3	04	3	34
Trenton, (97 m.) for shipment, including shipping and wharfage	2 11	1 95	2	45	2	46	2	76

From *Mauch Chunk* to *New York* (121 miles), (towing limits) and Jersey City† via Lehigh Valley RR. $2 37
From *Mauch Chunk* to *Philadelphia* (93 m.) via L. V. and L. and S. RR. and North Penn. RR 1 75
††From *Phillipsburg, N. J.* to *Hoboken* (84 m.) for shipment via Delaware. Lackawanna and Western RR., Morris and Essex Division 1 08
From *Lackawanna Junction* to **Auburn, N. Y.*, (191 m.) for shipment, via Southern Central R.R. in connection with Pa. and N. Y. R.R. 2 41
From *Lackawanna Junction* to *Weedsport* (201 m.), for *Rochester and Charlotte* 2 47
From *Lackawanna Junction* to *Sterling* for *Oswego, N. Y.*. 2 50
‖ To this point for all places between Rochester and Buffalo the rate is 2 53
* The rate to this point for Syracuse is 2 08
** Rates on line coal from Hazleton are 10c. per ton above these figures.
‡ The cost of unloading is to be added to these rates. No charge less than 40c. per ton will be made for any distance. Tolls from Mauch Chunk to Phillipsburg for way points will be $1 15 per ton.
§ Twenty cents per ton less when five cars at a time to one party. Provided that where the reduction makes the rate $1 a ton, or less, the rate will be $1.
† Transportation on Coal destined for re-shipment from this point is 20c. less than above rate.
†† The rate for consumption to this point is $1 80.
The distances in the above table are Computed from *Mauch Chunk*. From *Ashley* to *Mauch Chunk* the distance is 51 miles, and from *upper Lehigh*, 33 miles. From *Hazleton* 24 miles and from *Penn Haven* 8 miles.
From *Wilkes-Barre* to *Perth Amboy* via the Lehigh Valley Railroad Company, the distance is 161 miles, and from *Mauch Chunk* it amounts to 106 miles.

Freights.

Per ton of 2240 lb.

PORTS.	From Philadelphia.	From Baltimore.	From Georgetown.	From Elizabethport, Port Johnson, South Amboy, Hoboken and Weehawken.
Augusta, Me	....	2 50	....	....
Albany	†80	...	...	....
Amesbury, Mass	....	....	....	....
Bangor, Me	....	1 50	....	1 00
Bath, Me	....	1 50	150–55	1 00
Baltimore	....	....	....	....
Boston, Mass	1 25@1 35	1 50	150–55	1 00
Bridgeport, Ct	*70	1 40	....	60
Bristol, R. I.	....	....	....	85
Cambridgeport, Mass.	§1 30@1 35	....	...	1 00
Derby	....	....	....	....
Dighton	....	....	....	....
East Cambridge	§1 30@1 35	....	....	§1 00
Fall River	1 25	1 40	....	85
Hackensack	*70	....	....	....
Hallowell, Me	....	....	....	....
Hartford	*70	2 00	....	....
Hoboken	†70	1 30	120–25	40
Hudson	....	1 30	1 40	....
Jersey City	70	1 30	1 25	40
Lynn, Mass	....	....	....	†1 00
Middletown	....	....	....	1 00
Mystic	....	....	....	....
Newark	....	1 50	....	....
New Bedford	1 25	1 50	145–50	85
Newburyport	....	1 75	....	1 10
New Haven	*70	1 40	1 40	60
New London	1 25	1 40	....	75
Newport	1 25	....	....	85
New York	70†	1 30	1 30	40
Norwalk	70‡	1 50	....	60
Norwich	1 25§	....	....	80
Pawtucket	1 25§	....	....	....
Philadelphia	....	....	....	....
Portland	1 25	1 50	....	1 00
Portsmouth, N. H.	1 40	1 60	....	1 10
Providence	1 25	1 40	135–40	80
Poughkeepsie, N. Y.	....	....	....	....
Rockport	....	....	....	....
Saco	....	....	....	....
Sag Harbor	....	....	....	1 00
Salem, Mass	1 25@1 35	1 50	....	1 00
Salisbury Pt., Mass.	....	....	....	....
Stamford	*70	....	....	60
Stonington	....	....	....	80
Taunton	..	..	....	....
Troy	†80	....	....	....
Warren, R. I.	....	....	....	85
Wareham	....	....	....	....
Weymouth	....	....	....	....

* And discharging and towing. † And discharging. ‡ And towing. § 3c. per bridge extra.

Freights on Bituminous Coals from the Mines to Tide Water Shipping Ports.

From the Mines to Cumberland and State Line (say an average of 20 miles), the legal charge is 2 cents per ton of 2240 lb. per mile.

From State Line to Amboy (346 miles) $4 per ton of 2000 lb. On coal shipped beyond this point there is a drawback of 75 cents per net ton.

From Cumberland to Baltimore (178 miles) $2.02 per ton of 2240 lb., or $1.80 per net ton (¼ cent per ton per mile for use of hoppers over C. & P. RR.).

From Cumberland to Georgetown (152 miles) by canal, $1.10. Tolls, 46 cents.

From the Mines to Piedmont, 4 cents per ton of 2240 lb. per mile on distances less than 4 miles, and 3 cents per ton per mile on distances over 4 miles, and 2 cents per ton per mile on distances over 10 miles.

From Piedmont to Baltimore (206 miles) $2.34 per ton of 2240 lb., or $2.08 per net ton.

From Osceola to Greenwich, Phila. (say 248 miles) per T. & C. RR, per ton bituminous coal of 2000 lb., less drawback of $1.46 $2.15; rate per gross ton, $2.60.

From Osceola to South Amboy, N.J., (317 miles) per 2000 lb., $4.03, less drawback, $1.03; rate per net ton, $3; add 12 per cent. for gross ton, 36 cents, terminal expenses, shipping, 20 cents; rate per gross ton, $3.56.

Towing.

Rates of Towing from New York to places on the *Hudson River*. Boats of 175 tons capacity and upwards.
Per ton of 2240 lb.

	cts.		cts.
Yonkers	9	West Point & Cold Spring	17
Piermont & Dobbs' Ferry	12	Poughkeepsie	20
Nyack & Sing Sing	15	Rondout	23
Peekskill & Haverstraw	16	Hudson	25

Rates for boats of 100 tons, per boat, are as follows :

Manhattanville	$10	Sing Sing & Peekskill	$20
Yonkers	15	Newburg	25
Tarrytown	18	Poughkeepsie	30

Special Rates will be made for Saugerties and Catskill.

East River, from the foot of Twenty-third street, to the following points, *and return*, per ton :

	cts.		cts.
New Haven & Norwalk	33	Middletown	65
Southport and Milford	35	Norwich	67
Branford	45	Hartford and Mystic	75
New London	60	Stonington	75

Derby 33 cts. per ton and $50 per boat extra.

Bristol, Fall River, Providence, New Bedford, *Special rates*. Boats having less than 200 tons, will be charged the same as if carrying that quantity.

* Rates of Towing from foot of 23d Street, E.R., to the following points.

Boats upwards of 150 tons capacity.

79th street 93d st. and Astoria, and return*..... $12	New Rochelle and Glen Cove $50
Mott Haven and Harlem†.. 16	Mamaroneck and Portchester 60
Flushing and Whitestone‡ 25	Greenwich and Darien ... 70
Little Neck and Port Washington 40	Round trip to Port Johnston 14
College Point and Bowery Bay 25	Round trip to Elizabethport 16
Roslyn..... 50	

From Hoboken to Limits (53d Street.) E. R.. $5; N. R., $6

Other Towing in the vicinity of New York, special rates :

* Small boats (less than 150 tons) to these points..... $10

† " " " " " " " " 14

‡ " " " " " " " " 20

Rates via the Hudson River are furnished to us by A. B. VALENTINE, No. 41 Jay Street. Rates via the East River are furnished by W. E. GLADWISH, No. 12 South Street.

*These rates are furnished to us by DAVID COX, 89 West St.

IRON MARKET REVIEW.

New York.

FRIDAY EVENING, June 2, 1876.

American Pig.—We are reported sales aggregating 3,500 tons of forge iron on private terms, and 600 tons of No. 2 foundry at $20. Some holders claim to be firmer than a few weeks ago, but we do not believe that prices for actual business are any higher, excepting for forge iron, which is in but light supply. We believe the movement to advance prices was nothing more than an effort to get one set of sellers practically out of the market, that another set might step in and offer their iron at the old rates. We quote at $22@23 for No. 1 foundry; $20@$21 for No. 2 foundry; and $18@20 for forge.

The following, which contains views similar to those we have constantly advocated since the panic, we re-produce from the Boston *Commercial Bulletin*:

"The iron trade in all its branches is still in a very unsatisfactory condition. Repeated reductions in price have stimulated no additional demand, and even the complete shutting down of many large blast furnaces and rolling-mills has given no steadiness to values. The owners of those which are still in operation have perforce resorted to a cutting down of the cost of production in order to meet the market, and here they have done wisely. Manufacturers who have closed their works have adopted the other policy of restricting production, and the latter class, unless their establishments are unfitted to the business, and hence unprofitable at even the lowest cost of production, have done foolishly. They have made the mistake of supposing that the panic was only a temporary aberration, and that the reaction would quickly set in that would carry prices up to about the old level, when they could recommence manufacturing at a profit, even while paying the old cost of production. The sooner the latter class realize that pig iron will not for years to come sell above $20 and $25, and that, if they wish to continue in the business, they must make it cheap enough to sell at that range, the better for themselves and the trade.

"We are aware that in this business an exceptionally large proportion of the cost of production is beyond the control of either merchant iron or pig iron manufacturers. If ore coal, and limestone continue high, they cannot profitably sell iron low, even though they pay the lowest market price for labor and economise in every possible manner. Since our manufacturers do not get these raw materials from the same sources as their foreign competitors, and hence pay different and generally higher prices, they cannot compete in the markets of the world so readily as say the cotton manufacturers. Ore and limestone have already declined considerably in price, and in the new season beginning with the opening of lake navigation the former will sell much lower than for years. The high price of coal is at present the chief bar to the opening up of an export trade in iron. When this is reduced, as it certainly will be within a year or two, either through the voluntary action of the Combination or through the breaking up of the monopoly, a large and steady export trade in American irons will begin, particularly to Canada, the West Indies, Mexico, and the countries of South America. But, without waiting for the cheapening of the cost of production, it would be a very profitable undertaking for our iron manufacturers to begin to canvas those markets at once. That exporting is at any rate not unprofitable at present is shown by the regular shipments from New York and Philadelphia, which are of an aggregate value of some $5,000,000 per annum. Like many other industries, the foreigners only need to know the quality and price of our goods and they will buy, even at present values."

Scotch Pig.—Although higher prices are announced in Glasgow, and a higher rate of freight has been adopted, yet this market shows no change in prices. We note sales of 50 tons of Coltness, at $30; 100 tons at $29.75; 200 tons of Glengarnock, on private terms; and Eglinton in retail lots, at $28@$28.50. We quote nominally at $28@$28.50 for Eglinton; $30@31 for Coltness; and $29.50@30 for Glengarnock.

MESSRS. JOHN E. SWAN & BROTHERS, Limited, of Glasgow, under date of May 19, report 116 furnaces in blast as against 123 a year previous; 63,199 tons of pig iron in stock in CONNAL & Co's. stores (a decrease of 55 tons during the week); shipments for the week ending May 13, 12,047 tons as against 12,659 tons for the corresponding week of 1875; quotations of No. 1 iron as follows:—Gartsherrie, 65/6d.; Coltness, 69/; Summerlee, 62/6d; Langloan, 67/6d.; Glengarnock, 63/6d.; and Eglinton, 57/6d.; quotations of freights as follows:—To New York, 3/6d.; Boston, 9/; New Orleans, 5/; Baltimore, 8/; Philadelphia 10/; San Francisco, 27/6d.

Iron Rails.—We are unable to learn of any further business since our last. Prices are about as follows at mills: iron rails, $39@$42, and steel, $58@$63.

Old Rails.—We are reported sales of 200 tons at $21.50, and 1,000 tons at $21.25.

Scrap.—We learn of no business, and quote at $27@$28 for No. 1 wrought.

STRIKE OF PITTSBURG IRON WORKERS.—PITTSBURG, June 2 All the conferences between the manufacturers and the puddlers have failed to prevent a lockout, and to-day very few of the puddling mills in this county are at work.

The mills will not shut down immediately, as there is comparatively a large stock of muck bar on hand, which will be worked up. By the time that is done, it is hoped a compromise will be made.

Baltimore. May 31, 1876.

Specially reported by Messrs. R. C. HOFFMAN & Co.

The iron market continues dull, with small sales at quotations.

Baltimore Charcoal	$30@35	Anthracite No. 3	$20@21 00
Virginia Charcoal	28@34	Mottled and White	17@19 00
Anthracite No. 1	23@24	Charcoal C B. Blooms	65@67 50
" No. 2	21@22	Refined Blooms	50@55

Boston. May 27, 1876

PIG is having a small picking-up trade at somewhat irregular prices. The offers of New York parties to sell cargoes at prices ranging from $21.50 to $22.50 for prime fancy brands No. 1, with freights offered at not over $1.25, seem to make a market here for five or ten-ton lots at just about relatively there cargo prices laid down here.

BAR is rather quiet, with the trade continuing to hold steadily on blacksmiths' orders at 2 3-10@2¼ a pound, and large machine orders $50@52.50 a ton.

At a meeting held in Philadelphia, the 24th inst., the price of nails was advanced to $3.15 for common 10 d's; $4.40 fine fishing 10's; box 10's $3.90; coopers' 10's $3.65; spikes $3.40; Swedes 4'd $4.65@7.15.

STEEL is very dull and prices remain steady.

We quote American tool, 14@15c.; American machinery, 8½@9½c.; Bessemer tires, 5½c.; Sweet's Excelsior Tire, 7½c.; English Tool, 15½c., gold.

OLD IRON has had a small business; one heavy sale, about 300 tons of water-pipe iron at 70c., is the only gossiping event of the week. Wrought scrap varies from $1.25 to $1.35, delivered, with few buyers at either price and fortunately little stock to be forced off. Light wrought is desired, and commands full prices in good lots. Of this, however, the supply is limited also. In other lines there is nothing doing except on the part of dealers, who are steadily loading up.—*Commercial Bulletin.*

Chattanooga, Tenn. May 30, 1876.

Specially reported by J. F. JAMES. pig iron broker, etc., 233 Market Street.

The market here remains about the same. Some few large shipments of cold short mill to the West, have been made. Standard qualities of foundry are scarce. The shipments from this market have been larger during the present month, than any three months the past two years.

The usual four months is given on quotations below:

Tenn. Ala. and Ga. Charcoal, No. 1 foundry	$21@ 22
" " " " No. 2 foundry	20@ 21
" " " " gray forge	17@ 18
" and Georgia coke, No. 1 foundry	18@ 19
" " " " No. 2 foundry	17@ 18
" " " " gray forge	15@ 16
White and Mottled	14@ —
Tennessee and Georgia cold-blast car wheel	24@ 25
Alabama " "	24@ 25
Old Rails	cash 22 00
Cast Scrap	" 12
Wrought Scrap	" 16

Cincinnati. May 30, 1876.

Specially reported by Messrs. TRABER & AUBERY, commission merchants for the sale of pig iron, blooms, ore, etc.

Below please find closing quotations of our pig iron market, viz.:

CHARCOAL.

Hanging Rock, No. 1 Foundry	$25 00@	—4 mos
" No 2, "	23 00@	—4 mos
" Mill	22 00@	—4 mos
Tennessee, No. 1, Foundry	23 00@24 00	—4 mos
Tennessee, No. 2, "	22 00@23 00	—4 mos
" Mill	21 00@22 00	—4 mos
Missouri, No. 1, Foundry	@	—4 mos

STONE COAL.

Ohio, No. 1, Foundry	23 00@	—4 mos
" No. 2, "	22 00@	—4 mos
Ohio Mill	21 00@	—4 mos
Missouri, No. 1 Foundry	27 00@	—4 mos
" No. 2, "	26 00@	—4 mos
" Mill	24 00@	—4 mos

CAR-WHEEL.

Hanging Rock, C. B	40 00@45 00	—4 mos
Tennessee "	30 00@33 00	—4 mos
Missouri "	34 00@35 00	—4 mos
Alabama "	30 00@33 00	—4 mos

BLOOMS.

Charcoal	60 00@ 75 00	—cash

SCRAP IRON.

Cast	50c.@ 85	—cash
Wrought	1 00@1 30	—cash

Louisville. May 30, 1876.

Specially reported by Messrs. GEORGE H. HULL & Co.

The market is dull, the demand being confined to small lots for immediate use. Stocks on hand are light.

The usual time, four mos., is allowed on the quotations below:

HOT BLAST—CHARCOAL.

No. 1 Foundry, from Hanging Rock Ores	$24 00@26 00
No. 2 " " "	22 00@23 00
No. 1, Mill, from " "	20 00@21 00
No. 1. Foundry, from Alabama, Georgia and Tennessee ores	22 00@23 00
No. 2, Foundry, from Ala., Geor'a and Tenn. ores	21 00@22 00
No. 1, Mill, from " " " "	20 00@21 00

HOT BLAST—STONE COAL AND COKE.

No. 1, Foundry, from Hanging Rock Ores	23 00@24 00
No. 2, " " " "	21 00@22 00
No. 1, Mill, " " " "	20 00@21 00
No. 1, Foundry, from Ala. Ga. and Tenn. Ores.	22 00@23 00
No. 2, " " " "	20 00@21 00
No. 1, Mill, " " " "	19 00@20 00
No. 1 Foundry, from Missouri Ores	—— @ ——
No. 2 " " " "	—— @ ——
No. 1 Mill, from Missouri Ores	24 00@25 00

COLD BLAST—CHARCOAL.

Car Wheel from Hanging Rock Ores	35 00@40 00
" " Tennessee "	28 00@30 00
" " Alabama and Georgia Ores	28 00@38 00
" " Kentucky Ores	28 00@38 00

Pittsburgh, Pa. May 31, 1876.

Specially reported by A. H. CHILDS, Esq.

The puddler question is again being agitated, and as a consequence, the metal market is in a very unsettled condition, few sales being made, and all parties awaiting the result of the conferences now being held. It is hoped that an amicable settlement will be reached, and mills continue to run.

In the meantime, quotations are nominally unchanged.

No 1. foundry	$23 50@25 00—4 mos
" 2. "	22 00@23 00—4 mos
Gray forge	21 00@22 50—4 mos
White and mottled	18 00@20 00—4 mos
Warm blast charcoal	22 00@25 00—4 mos
Cold blast " Western	40 00@45 00—4 mos

Richmond, Va. May 29, 1876.

Reported by ASA SNYDER, Esq.

No change in previous quotations in charcoal pig iron. Receipts continue very light. Sales are not large but in excess of receipts.

Virginia Cold Blast Charcoal Pig Iron	$27 to $33
" Warm " " " "	24 to 28
" " " Coke " " 1 X	23 to 24
" " " " " " 2 X	21 to 22
" " " " " " 3	20 to 21
" Anthracite 1 X	24 to 23
" " 2 X	22 to 22
" " 3	21 to 25

St. Louis. May 30, 1876.

Specially reported by Messrs. SPOONER & COLLINS, Commission Agents for all kinds of Iron.

Our market remains the same as last reported. Every thing is extremely dull, and but little encouragement for the future.

Mo. Stone Coal	No. 1 Fy. $25@26	Massillon Iron,	A No 1. 20@30
" " "	2 " 23@24	" "	B " 1. 1@—
" "	Gray Mill, 22½@23	" "	" 2. 2@—
" Charcoal	No. 1, Fy. 23@24	Cold Bl. Car Wheel,	Mo. 30@33
" " "	2, " 22@23	" " "	" Tenn. 30@33
" "	Gray Mill, 22@23	" " "	" Ala. 30@33
Tenn. "	No. 1, Fdy 23@24	" " "	" H. R. 33@35
" " "	2, " 22@23	Mo. Charcoal Blooms	50@65
"	"Gray Mill 22@23	" Scrap	" 45@55
Va. Coke,	No. 1, Fdy. 24@25	" "	hammered 75@80
" " "	2, " 23@24	ed Billets	75@80
"	"Gray Mill, 21@23	Assorted Bar Iron	2 50, 60days
H. R. Char.	No. 1, Fdy. 25@26	No. 1 Wrought Scrap	90c. cwt.
" " "	2, " 24@25	Heavy cast	" 70 "
" "	Gray Mill, 24@25	Light	" 50 "

San Francisco, Cal.

From the *Commercial Herald*, May 25, 1876.

The British ship *British Navy* brought us 8,844 boxes tin plate, which, fortunately, was for the most part sold prior to arrival. It is stated on 'Change that a very large proportion of this year's imports of English tin plate has been landed in a damaged condition. Parcels in our best ships noted for delivering goods in perfect condition turn out rusty and damaged. This can only be accounted for by the presumption that the same had been wet or rained on prior to being taken on board ship. The *Ajax* from Oregon brought only thirty tons pig iron; price, $32.50. The stock of Scotch pig iron is very great, and holders disposed to sell have to submit to low figures. Bar, sheet, and round iron find ready sale at steady prices. Trade generally is moderately active. Sales ex-ship of 450 empty quicksilver flasks at $1.

Montreal. May 23, 1876.

We continue to quote: Pig iron Eglinton and Clyde $21@21.50; Carnbroe $21.50@22; American $22@24; Summerlie and Calder $22@23; Langloan and Gartsherrie $22@23; Coltness $22.50@23.50; Hematite $30@31. Bar, per 100 lb., Scotch and Staffordshire, $2.20@2.25; best do., $2.50@2.60. Swedes and Norway $5@5.50; Low Moor and Bowling, $6.50@7.—*Monetary Times.*

METALS.

NEW YORK, FRIDAY EVENING, June 2, 1876.

The business of the week under review has been confined entirely to jobbing lots; no large lots having been moved in any of the articles of this list. Buyers confine their purchases to almost their immediate necessities, so that it is impossible to estimate the amount of trade likely to be done during the summer.

Gold Coin.—During the week under review, gold coin has ranged from 113¾ to 112¾, and closed at 112¾.

Bullion.—The silver market is unchanged. The demand is light and prices only nominal. We quote at 113 per oz. in this city; 13 per cent. discount in San Francisco; and 51 7/16d.@52d. per oz. in London. Gold bars are nominal and unchanged in prices. We quote

n this city at par ($20.67 gold, per oz.) to ¼ per cent. premium; in San Francisco, par; and in London, 84/7½d. per oz.

Copper.—The sales during the week have been quite limited, with a downward tendency to prices; the market closing with copper offered at 20½c. The tendency is such that prices are likely to be checked, and again advanced to about 23c., by some further sales to Europe. It is rumored that there are negotiations tending to this end.

Tin.—The result of the regular Banca sales has quite unsettled the tin market. The average price realized, was but 45¼ florins, 7 florins less than the average of the previous sale, and equal to but £78 in London. It is impossible to state what the quotation of Straits in London is, as cable reports to-day give prices ranging from £73 to £75. This market has declined in sympathy with London, although prices, in the absence of business, are quite nominal. We quote, in gold, all kinds at 18c., excepting Banca, which is quoted at 22½c.

Tin Plates.—Some dealers report a very fair jobbing demand, but on the whole, trade continues very quiet. Prices are unchanged, and as follows, gold, per box: Charcoal tins, $7@7.25, and ternes, $6.50@7; coke tins, $6@6.25, and ternes, $5.62½@6.

Messrs. ROBERT CROOKS & Co., of Liverpool, under date of May 18, say of tin plates: "While there is no improvement whatever in prices, and makers are now almost hopeless of any near relief, stocks from most centers of consumption are reported unusually small, and this is attracting considerable quantities from the stocks in our shipping ports; these latter quantities are very large, and heavy shipments can be made without much buying from the makers."

Lead.—The Government has accepted bids for 200 tons, at an average price of 6.40c., gold. Buyers have been awaiting the Government's action, and but very little business has been transacted in ordinary Domestic, which is nominally quoted at 6¼c., gold.

Spelter and Zinc.—The demand continues to be light. Outside lots of Domestic Spelter are firmly held at 7¾c., currency, while the Combination continues to ask 8c., currency, with the usual terms. Sheet zinc is quoted at 8¼@8¾c., gold.

Antimony is quiet, and quoted at 15½c.

Quicksilver is a little lower in price in this city and San Francisco. The quotations are as follows: New York, 58c.@60c., gold; San Francisco, 54c. per lb; and London, £10 per flask.

The San Francisco *Commercial Herald*, of May 25, says: "Exports in April to China and elsewhere have been quite large, owing to the very low freight charged thereon. The present spot demand is light, not equal to the receipts, and in order to keep up prices some of our largest producers and receivers are exporting their receipts. Notwithstanding all this, the market is weak, and prices are unmistakably pointing to 50c. At this rate it is thought that some of our present producing mines will be compelled to close all smelting furnaces, as the yield per cent. will not cover the cost of production. The present nominal price, 53@55c. The steamer *Lord of the Isles* for Hongkong, carried 413 flasks. We note sales of 250 flasks for export at 52½c. The steamer *South Carolina* for Panama carried 500 flasks for Callao, 150 flasks for Chili, and 325 flasks for New York. The *Zealandia* for Australia carried 27 flasks.

Our monthly receipts of this article compared with 1875 are as follows:

	1875.		1876.	
MONTH.	Bay, flasks.	Coast, flasks.	Bay, flasks.	Coast, flasks.
January	1,605	2	3,877	281
February	3,284	309	3,864	62
March	3,779	465	3,762	154
April	3,718	100	4,313	317
Totals	12,386	876	15,816	814

Our exports by sea for April, 1875-76, were as follows:

	1875.		1876	
To	Flasks.	Value.	Flasks.	Value.
China	1,440	$88,750	600	$25,936
Japan	58	3,507	25	1,147
Mexico	315	18,430	349	16,019
Australia	120	6,410	40	1,803
New Zealand	15	786	30	1,328
South America	500	29,950	100	4,590
Victoria	2	128	4	182
Calcutta	10	550	...	...
Russian Asia	3	195	...	...
Totals	2,463	$148,706	1,148	$51,005

FINANCIAL.

New York Stocks.

FRIDAY EVENING, June 2, 1876.

We note a slight improvement in the quotations of coal stocks, with a decrease in sales of nearly 42,000 shares compared with the transactions reported in our last, the total sales for the week amounting to only 13,451 shares.

Delaware, Lackawanna and Western Railroad.—This stock exhibits an advance of 1⅞, with sales of 5,450 shares for the week. The complete change of the lines of this company to narrow gauge, is now an accomplished fact. On Saturday last 297 miles were altered from wide to narrow (4 feet 8½ inches) gauge, with scarcely an interruption to the regular running time of the trains.

The New Jersey Central RR. stock is steady, 81⅞ and 84 represent the extreme limits for the week, the stock closing at the lowest figure, with sales amounting to 6,552 shares.

Delaware and Hudson Canal Company stock was advanced three points, with sales amounting to only 50 shares.

St. Louis and Iron Mountain RR.—This stock is down to 15 and neglected.

Mariposa Land and Mining Company.—300 shares of this stock has sold during the week at from 5¼ to 6⅝. The large mills of the company were started on May 17th on gold ores from the Mother Lode of California. Two batteries are running.

Union Mining Company of Tennessee.—Nearly 15,000 shares of this stock has changed hands during the week at from 1½ to 1¾.

Bonds are comparatively quiet and generally lower.

Cumberland Coal and Iron Company.—100 shares of this stock sold at auction during the week at 6¼ per share. The annual meeting of this company will be held on the 5th inst.

Chesapeake and Ohio RR.—The bonds of this company are almost neglected. We note a sale of $1,000 during the week at 28. Judge WELFORD, of the Circuit Court of Richmond, Va., has appointed Col. THOMAS J. EVANS a commissioner to take an account of all the property, real and personal, and of all the rights and interests of or belonging to the Chesapeake and Ohio Railroad Company, and an account of all the indebtedness of the Company of every description whatever.

United Nickel Company.—The annual meeting of this company will be held on the 6th inst.

Union Mining Company of Allegheny County, Md.—This company will hold their annual meeting on the 5th inst.

Interest is due on the bonds of the following companies during the present month:

Delaware, Lackawanna and Western Railroad Company.—Coupons on their convertible bonds and the consolidated mortgage bonds of the Morris and Essex RR.

Milwaukee Iron Company.—Coupons.

St. Louis and Iron Mountain RR.—The coupons on the gold bonds of the Arkansas branch of this company are now being funded in New York.

Pennsylvania Coal Company.—This company will hold their annual meeting at Hawley, Pa., on the 13th inst. for the election of directors, etc.

Quotations and Sales of Stocks and Bonds.

For the week ending June 2, 1876.

STOCKS.

	Highest	Lowest	Closing	Shares sold.
Pennsylvania Coal Co	—	—	*270	—
Consolidation Coal Co	41⅛	40¼	40¼	200
Spring Mt. Coal Co	—	—	*64½	—
American Coal Co	—	—	*46	—
Maryland Coal Co	—	—	13⅛	—
Del., Lack., and West. RR. Co	106	104⅛	105⅞	5450
New Jersey Central RR. Co	84	81½	81⅝	6552
Delaware and Hudson Canal Co	109	106	108½	49
Quicksilver Mining Co. pref'd	—	—	18	—
" " Common	15¾	15⅛	15½	900
Mariposa Land & Min. Co. pref'd	6⅛	5½	6⅛	300
St. Louis & Iron Mountain RR	—	—	15	—
Lehigh & Wilkes-Barre Coal Co	—	—	*40	—
Total Shares sold				13451
Sales for the week previous				55147
Decrease				41696

* Nominal.

BONDS.

	Sales.		Price
Ches. & O. R. R. 6s, 1st. cou. on	1,000	.....	— @ 28
" " " ex coupon	—	.....	— @ 26
Central RR. of N. J. 1st Mtg. N.	1,000	.....	— @111⅞
" " " 1st Cons.	17,000	.....	104½@105
" " " Convt.	9,000	.....	100½@101
Del. and H. Canal, 1st Mtg. 91'	—	.....	— @111
" " 78, '84	6,000	.....	— @109
" " Reg. '94	—	.....	— @108
Del., Lack. & W. R. R., 7s, conv.	—	.....	— @ —
" " " " 2d Mtg.	—	.....	— @108¼
St. Louis & Iron Mount'n 1st Mtg	—	.....	— @102
St. Louis & Iron M'tn, 2d Mtg.	2,000	.....	— @ 78
Lehigh & Wilkes-Barre Cons.	—	.....	— @ 92
Total Sales	$36,000		

Closing quotations, in the absence of sales, represent the latest prices bid.

Philadelphia Stocks.

PHILADELPHIA, June 1, 1876.

The range of quotations in this market during the week has been quite limited, the list generally closing rather above the prices prevailing the previous week. The aggregate transactions amount to nearly 68,000 shares, being a slight decrease from the sales reported in our issue of the 27th ult. This may be accounted for by the closing of the Stock Exchange on Decoration Day, which was generally observed as a holiday here as well as in New York.

Pennsylvania RR.—This stock has been very active, the sales aggregating nearly 56,000 shares, the stock closing at a decline of nearly $1 per share from our last. This decline is probably owing to the *cutting* of rates in competition with other roads on the company's Western passenger traffic, and also to the possibility of the earnings from the Centennial travel being below the amount generally anticipated a few weeks ago.

Lehigh Valley Railroad.—This stock has advanced $1 per share, with sales amounting to 1,251 shares.

Reading Railroad.—This stock is very steady, the quotations being an exact repetition of those published in our last. Sales for the week aggregate 6,373 shares. The Reading *Journal* of May 20, says: "Owing to the continued depression in the iron and coal trade, and consequent falling off in transportation, the Reading Railroad Company has been compelled to reduce its working force in the various shops in this city and along the line of the road. The plan adopted in reducing the force is the same as heretofore, that is to suspend gangs of men for a week or two, turn and turn about. It is not probable that the suspension will continue for more than a month or six weeks at the farthest, as by that time the stock of coal at Richmond and along the line will be worked up. The efforts of the management will be to make the stoppage fall as lightly as possible on the employees of the road.

Lehigh Coal and Navigation Company.—This stock is a little stronger, 4540 shares represents the total dealings for the week; 43¼ and 45¼ represent the extreme quotations, and 44⅞ the closing price.

Bonds have been pretty freely dealt in, $87,200 having been sold during the week without any noteworthy change in prices.

The Sales of Stocks and Bonds at Auction during the week were as follows:

Westmoreland Coal Company.—25 shares at $80 per share.

Delaware Division Canal Company.—14 shares at $51 per share.

Reading Coal and Iron Company.—$2,500 purchase-money mortgage coupons, January and July at 62 per cent.

Schuylkill Navigation Company.—$3,000 of their 6 per cent. mortgage bonds, at from 75 to 75¼ per cent.

Little Schuylkill Navigation Railroad and Coal Company.—25 shares at $45½ per share.

Interest is due on the bonds of the following companies during the present month:

Chesapeake and Delaware Canal Company coupons.

Dunbar Iron Company coupons.

Lehigh Coal and Navigation Company coupons on their 6 per cent. gold loan of 1897; also interest on their consolidated mortgage 6 per cent. loans of 1877 and 1882, and convertible registered loan of 1882.

Lehigh Valley RR.—Interest on the first mortgage 6 per cent. registered bonds of 1898; also on the consolidated mortgage 6 per cent. annuity bonds of 1923; also on the consolidated sterling gold loan. This company will also pay the interest on the 7 per cent. bonds of the Pennsylvania and New York Canal Co.

Pennsylvania RR. Company.—Interest due on the 15th on the consolidated mortgage registered bonds of this company will be paid from and after that date.

Philadelphia and Reading RR. Company.—Interest and coupons on the consolidated registered mortgage loan.

Reading Coal and Iron Company.—Interest and coupons on the registered Coal Land Loan.

Quotations and Sales of Stocks and Bonds.

For the week ending June 1, 1876.

STOCKS.

	Highest	Lowest	Closing	Shr's
Lehigh Valley RR. Co	57½	55¾	56½	1251
Pennsylvania RR.	53	51¾	51⅞	55609
Reading RR.	44¼	43¾	44	6373
Lehigh Coal and Nav. Co	45¼	43¼	44⅞	4540
Penn. Canal	—	—	*9	—
Buck Mountain Coal Co.	—	—	25	—
Fulton Coal Co.	—	—	*3½	—
Locust Mountain Coal Co	—	—	—	—
Westmoreland Coal Co.	—	—	80	—
St. Nicholas Coal Co.	—	—	*1	—
Cambria Iron Co.	—	—	15½	70
Crane Iron Co.	—	—	25	—
Emaus Iron Co	—	—	—	—
Pennsylvania Salt Manufact. Co.	—	—	68¼	—
Total shares sold				67,843
Sales for the week previous				70,531
Decrease				2,688

* These quotations are nominal.

BONDS.

	Sales.		Price
H. and B. T. RR. 1st mortgage, 7s	—	—	@107
" " " 2d "	—	—	@104
" " " 3d " cons	—	—	@ 45
Lehigh Valley RR. Con. mtg. 6s, con	—	—	@106
" " " 7s, 1910	—	—	@109¾
" " " 6s Reg.	—	—	@107
" " C. M. 6s 1923	6,000	—	98¾@101
Pennsylvania RR., 1st mtge. 6s	—	—	@106
" " gen. " cou. 1910	3,000	—	@105½
" " gen. " 6s, reg.	2,000	—	@106
" " Cons. M. 6s reg.	—	—	@100
Phil. & Reading RR. 7s '93	4,000	—	@107
" " G. M. 7s, reg.	16,000	—	104¼@105
" " " " 7s cou.	38,000	—	108 @108½
" " new convertible 7s	3,500	—	@100
" " mtg. 6s '43-'80	—	—	@ —
Phil. & Reading C. & I. Co. Deb. 7s	—	—	@ 78¾
" " Swatara tract	—	—	@ —
Lehigh Coal & Nav. Co., 6s '84	2,200	—	@102½
" " " RR. 6s, '97	1,500	—	@102½
" " " gen m. 7s Reg.	—	—	@105
" " " Convt. gold, '97	11,000	104	@104¼
Penn. Canal, 6s	—	—	@ 75¼
Penn. and N. Y. Canal, 7s	—	—	@107½
Ches. and Del. Canal, 6s	—	—	@ 86½
Susquehanna Canal, 6s	—	—	@ 73¼
Delaware Division Canal, 6s	—	—	@ 99¾
Susquehanna Coal Co. 6s	—	—	@ 80
Buck. Mount Coal Co. 6s	—	—	@ 97½
Penn. Gas Coal Co. 6s	—	—	@100¼
Honeybrook Coal Co. 7s	—	—	@ 90
Total amount of sales	$87,200		

Closing quotations, in the absence of sales, represent the latest prices bid.

Copper Stocks.

Specially reported by Messrs. WILSON W. FAY & Co., Bankers and Brokers, Room 7 Traveller Building, 31 State Street, Boston.

BOSTON, THURSDAY EVENING, June 1, 1876.

There is nothing in our copper market calling for comment, and transactions are reduced to the lowest possible limits. Calumet has declined from 166¼ to 163¼ this A.M., but closes to-night with sales at 164 and same bid. Copper Falls has had a single sale at 4, but the same is asked. Duncan silver is quiet at 1⅜ asked. Franklin has dropped from 11½ bid to 10¾ asked. There is a street rumor of an assessment, but nothing official. Quincy has sold during the week at 46¼, but is now offered at 46. We note a sale of Phœnix at 13. Nothing in small coppers, with the exception of Rockland, which is in demand at ¼. It is said the Rockland has shipped $15,000 worth of copper as their winter work, one-third of which goes to the company.

DESCRIPTION.	Par Value.	No. of Shares.	CLOSING. Bid.	Asked.
Allouez	$50	20 600	$11 25	$11 75
Calumet and Hecla	25	80,000	164 00	164 12½
Central	25	20,000	30 50	31 00
Copper Falls	50	20,000	3 62½	3 87½
Dana	25	20,000	8	10
Franklin	25	20,000	10 25	10 75
Humboldt	25	20,000	10	12½
Madison	25	20,000	27	30
Mesnard	25	20,000	55	60
Minnesota	25	20,000	1 50	2 00
National	15	20,000	1 25	1 50
Osceola	25	40,000	21 00	22 00
Petherick	25	20,000	54	56
Pewabic	25	20,000	4 00	4 25
Phenix	25	20,000	12 00	13 00
Quincy	25	20,000	45 50	46 00
Ridge	25	20,000	5 00	5 12½
Rockland	25	20,000	25	30
International Silver	20	60,000	8	12½
Star	25	20,000	50	53
Superior	25	20,000	10	12½
Duncan Silver	20	60,000	1 25	1 37½

Gold and Silver Stocks.

NEW YORK, FRIDAY EVENING June 2, 1876.

With but a single exception, the San Francisco Mining share market is lower, with slightly increased activity noticeable in the transactions.

California.—This stock is steady. The present weekly extract of ore amounts to about 2,500 tons. The bullion yield for the first twenty days in May amounted to $870,893. The average yield of the ore for the month of May will, probably, amount to about $125 per ton. The ore breasts were never showing richer than at present. Laying the foundation sills for opening out more extensively on the ore body is going rapidly forward. Had the company the mills with which to crush the ore, no effort whatever would be required to take out and mill ore sufficient to produce $3,000,000 per month The north winze, below cross-cut No. 6, has reached the 1600-foot level, at which point a drift is being run to connect with the Ophir mine for ventilation purposes. On the 1400-foot level the north drift is being steadily pushed ahead to connect with the Ophir.

Consolidated Virginia.—No change in this stock. The weekly ore product amounts to nearly 2,500 tons, the bullion product for the first twenty days in May, is given at $470,424, or but a little more than half of that of California. A very important feature in connection with the Consolidated Virginia Mine, has been the starting up the north drift on the 1,700-foot level of the Best & Belcher Mine, to cut and prospect the Consolidated Virginia ore vein. This drift will cut the ledge at a depth of nearly 200 feet below the present workings, and will penetrate nearly 100 feet lower down than the bottom of the winzes sunk below the 1,550-foot level of the Consolidated Virginia and California. The developments to be made by this drift will be looked forward to with deep interest by every person having or taking an interest in the Comstock lode. The erection of the new Consolidated Virginia amalgamating mill, and the new 80-stamp mill east of the C. & C. shaft, is going rapidly forward.

The ore from the mine is wet down as it is deposited in the ore house, to save the dust, which is fine chloride of silver and valuable; and in the California mine the ore is sprinkled in the breasts, with the same object. It is made so wet that there is no danger of its being blown away before it reaches the mills.

It is anticipated that the California and Consolidated Virginia Mining Companies will declare $3 dividends, hereafter. If so it will require a monthly disbursement of $2,980,000, which is equal to nearly $25,760,000, in dividends yearly, for the two Companies.

Savage.—In this mine the deep foundations for the immense pumping machinery now in course of construction are being laid as fast as the workmen can accomplish the task. This stock is quoted at $16 per share, which is $2 per share below our report of the 25th ult.

Chollar Potosi, is a little lower, 600 tons, as about the average weekly product of this mine assaying $32.50 per ton.

Hale & Norcross.—This stock has made a notable decline of $11 per share. This Company has increased its share capital to 112,000 shares, against the old issue of 16,000 shares. An assessment of $1.50 per share on the new stock has just been levied, amounting to $168,000, delinquent June 21st. This stock is worth, on the new basis, about $7.50 per share.

Ophir is $2 per share lower. The present monthly bullion product of this mine is equal to about $120,000.

Consolidated Imperial.—This stock is steady. Ore from the deepest workings of this mine it is stated will assay $200 per ton.

Best & Belcher.—Nothing is doing in this mine at present, the north drift on the 1700-ft level connecting with the GOULD & CURRY having been repaired, and the temperature being too great to yet attempt to cross cut. The Best & Belcher is equally interested in the new pumping machinery now being erected by the Gould & Curry, and must wait until the improvements on the shaft and the erection of the machinery is completed, before the development of the lower levels can proceed. This stock is lower by $1 per share.

Meadow Valley is up 50 cents per share and is now quoted at $1.

The Sutro Tunnel is now in a distance of 13,200 feet. A large quantity of water is being encountered, which retards the work of running the tunnel. The present rate of progress is about sixty feet per week. In order to guard against the danger of the tunnel being suddenly flooded with water, holes are drilled in the face of the heading a distance of from seventeen to twenty feet. The whole number of men working in the tunnel at present on the different shifts is one hundred and twenty-five. The work of enlarging the tunnel has been completed, so that locomotives can be brought into requisition in hauling out the waste rock. A number of men are engaged in laying a track for the same. The locomotives have been overhauled and put in order for work. In order to avoid the presence of smoke in the tunnel no firing will be done after ente ing, except at shaft No. 2, where there is a good draft upward.

QUOTATIONS:

	No. of feet on Vein.	No. of shares.	May 25.	June 1.
Sierra Nevada	3,300	100,000	$15	$13
Union Consol'd	600	100,000	12	12
Mexican	600	108,000	33	32
Ophir	675	108,000	56	54
California	600	540,000	80	80
Consol'd. Virginia	710	540,000	73	73
Best & Belcher	540	100,800	55	54
Gould & Curry	612	100,800	16	15
Savage	771	112,000	18	16
Hale & Norcross	400	16,000	64	53
Chollar Potosi	1,400	28,000	85	84
Alpha Consol'd	306	30,000	57	56
Imperial Con	468	500,000	6	6
Yellow Jacket	957	122,000	37	35
Kentuck	95	30,000	14	12
Crown Point	541	100,000	11	11
Belcher	1,040	104,000	22	22
Overman	1,200	38,400	63	62
Caledonia	2,188	100,000	9	8
Justice	2,100	105,000	24	22
Raymond & Ely	5,000	30,000	11	8
Meadow Valley	4,402	60,000	500	1
Eureka Consolid.	....	50,000	11	11
Eureka G. V.	1,680	20,000	3	3
Silver Hill	5,400	54,000	8	8
Julia	3,000	110,000	10	10

Gas Stocks.

NEW YORK, Friday Evening, June 2, 1876.

Gas stocks are extremely dull, very slight changes have occurred in our quotations and no transactions of any importance are reported to us. The general tendency of prices is downwards.

Lynn, Mass., Gas Co.—A few shares of this stock was sold at auction during the week, at $78 per share.

Citizens Gas Co., of Wakefield, Mass.—We note auction sales of this stock in limited amounts, at $58 per share.

The Fond du Lac, Wisconsin, Gas Co. Manufacture their gas mostly from tamarack wood.

Georgetown, Colorado.—Gas Works are being erected in this place.

Montreal Gas Co.—This Company has contracted with the International Coal Co. of Cape Breton for a supply of from 25,000 to 30,000 tons of coal during the coming summer.

Greenpoint, N. Y., Gas Co., will hold its annual meeting on the 5th inst.

Williamsburgh Gas Co., will hold its annual meeting on the 5th inst.

The Gas Light Co. of America, will hold its annual meeting on the 6th inst.

Citizens Gas Co. of Newark, N.J.—The coupons on the bonds of this Company are payable during the present month.

Metropolitan, N. Y., Gas Co.—The coupons on the bonds of this Company are payable during the present month.

Peoples Gas Light Co. of Chicago, Ill.—The June coupons on the bonds of this Company will be paid in New York.

The following list of Companies in New York and vicinity are corrected weekly by GEORGE H. PRENTISS, Broker and Dealer in Gas Stocks, No. 30 Broad st., N. Y.

Quotations "bid" and "asked" of New York City and Vicinity Gas Companies are on the $100 of stock and not on one share.

Companies in New York and Vicinity	Cap. Stk.	Par.	last Divid.	When Paid.	Bid.	Askd.
			pr.c			
Mutual, N. Y.	$5,000,000	$ 100	2¾	Jan. '76	109¾	110½
" " Bonds	900,00	1,000	†3½	Feb. '76	105	
NewYork, "	4,000,000		5	Jan. '76	130	140
Metropol. "	2,500,000	100	5	Mar. '76	142	145
" " Certf.	1,000,000	....	3½	" "	103¾	
" " Bonds	500,000	1,000	3½	Jan. "	102	102½
Harlem "	1.850,000	50	4	Feb. '76	118	122
Manhattan "	4,000,000	50	10	Jan. "	250	254
Brooklyn, B'klyn	2,000,000	25	5	Nov. '75	190	200
Nassau "	1,000,000	20	4	Jan. '76	80	85
" " Certf.	700,000	1,000	3½	Nov. '76	94	95
People's "	1,000,000	10	3½	Jan. '76	50	60
" " Certf.	300,000	1,000	3½	Jan. '76	83⅜	87
" " Bds	325,000	....	3½	Feb. "		95
Metropol. "	1,000,000	10	3½	Nov. '75	75	80
Wmsburgh "	1,000,000	50	5	Jan. '76	122	130
" " Certf.	1,000,000	....	3½	Jan. "	100	102
Citizen's "	1,200,000	20	2½	Jan. '76	87	90
" " Certf.	320,000	1,000	3½	April "	99	101
J. C. N. J.	336,000	20	5	July, '75	160	170
Centl. Westch. N.Y.	466,000	50	4	July. "	95	100
Subur'n " "	390,000	50				95

† Gold.

Companies out of Town.*	Cap. Stk.	Par	Bid	Askd.
People's " " of J. C.			120	133
¶Citizen's G. L. Co., New'k. N.J.	1,095,000	50	85	90
Hempstead " " L. I., N.Y.	40,000	100		100
Jamaica, " " "	25,000	100		100
Richmond Co., S. I. "	300,000		100	105
Citizens', Rochester, "		100	60	68
Rochester Gas Co., "		100	50	
‖People's G. L. Co. Albany, "	1,000,000	100		25
§Mutual " Buffalo "	750,000	100	48	55
Mutual " Detroit. Mich.		50	18	
TroyG. L. Co., Troy, N. Y.			108	
Citizens " " "	600,000	100		100
Brockport, N. Y., G. L. Co.	25,000	100	60	80
†Baltimore G. L. Co., Balt., Md	2,000,000	100		180
St. Louis G. L. Co., St. Louis, Mo	600,000		110	130
People's G. L. Co., Balt., Md	2,000,000	25	25	25½
Hannibal G. L. Co., Hanni., Mo.	100,000	100	95	100
La Clede, St. Louis, Mo	1,200,000	100	110	115
Lewiston G. L. Co., Lewis., Me	400,000	100	50	85
Chicago G. L. Co., Chicago, Ill.	2,000,000	100	125⅝	
Jacksonville, Ill.	120,000	100	82	
‡Lima, Ohio	60,000	100	10	
Derby G. L. Co., Derby, Conn.	160,000	100	60	80
Woonskt G. L. Co. Woonskt, R.I.	150,000	100	100	
Fort Wayne G. L. Co. F. W., Ind		100	90	100
North. Liberties G. L. Co. Phila.		25	29	
Wilkes-Barre G. L. Co W. B. Pa.		50	70	
Washington G. L. Co., Phila.			42	43
Pottsville, Pa. Gas Co		50	40¼	
Portland G. L. Co. Portland, Me	350,000	50	72	75
Hartford G. L. Co., Hartford, Ct	700,000	25	41	
Boston G. L. Co., Boston, Mass.	2,500,000	500	785	790
East Boston, Mass		25	132	
Chelsea G. L. Co., Chelsea, "	300,000		139	
Cambridge G. L. Co., Cam., "	700,000		132¾	
Louisville G. L. Co., Louis., Ky.			127	
Cincinnati G. L. Co, Cincin, O.				200
Carondelet G. L. Co., Mo		50		6¼
S. F. G.L. Co. San Francisco, Cal	10,000,000	100	99	99½
Stillwater G. L. Co., Minn.	50,000	50		26
City G. L. Co. Montreal, Can.	1,440,000	40	166	
Consumers G. L (old.) Tor., Ont	600,000	50	133	
Hamilton G. L. Co., Ont.	150,000	40	112½	
Halifax G. L. Co., Halifax, N.S.	400,000	40	146	149

* These quotations represent the latest obtainable prices at which sales were made.

† This Company has issued $1.000,000 in certificates in addition to their stock indebtedness, on which they pay interest at the rate of 6 per cent. gold.

‡ This Company has $30,000 in bonds outstanding.

§ $200,000 represents the bonded indebtedness of this Company.

‖ $350,000 of the indebtedness of this company is represented by bonds.

¶ $124,000 of the indebtedness of this company is represented by bonds; also $53,000 in certificates, which is included in the aggregate stock debt quoted.

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